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ABSTRACT

The ocean affects all of our lives. Therefore, awareness of and information about the interconnections between humans and oceans are prerequisites to making sound decisions for the future. Project ORCA (Ocean Related Curriculum Activities) has developed interdisciplinary curriculum materials designed to meet the needs of students and teachers living in Washington State. Each activity packet provides the teacher with a set of lessons dealing with a particular topic related to the oceans. Included are student worksheets, lesson plans, a vocabulary list, and a bibliography. This unit, designed for grade levels 3, 4, and 5, presents important facts regarding the life cycle of salmon in Northwest waters, emphasizing the importance of clean water in our environment. It stresses the unique migration and breeding habits of salmon and relates its constant struggle for survival. This activity packet alerts learners to ways in which they can help protect the salmon's natural environment. (TW)

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LIFE CYCLE OF THE SALMON

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ORCA

OCEAN RELATED CURRICULUM ACTIVITIES

PACIFIC SCIENCE CENTER / SEA GRANT
MARINE EDUCATION PROJECT
Andrea Marrett, Manager
Kathy Tarabochia, Writer
Susan Lundstedt, Illustrator

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ORCA PUBLICATIONS

ELEMENTARY

High Tide, Low Tide (4th Grade)
Life Cycle of the Salmon (3rd - 4th Grade)
Waterbirds (4th - 5th Grade)
Whales (4th - 6th Grade)

JUNIOR HIGH

Beaches
Beach Profiles and Transects
Early Fishing Peoples of Puget Sound
Energy from the Sea
Literature and the Sea
Tides
Tools of Oceanography

SENIOR HIGH

American Poetry and the Sea
Marine Biology Activities
Marine Biology Field Trip Sites
Marshes, Estuaries and Wetlands
Squalls on Nisqually: A Simulation Game

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PROJECT ORCA

The ocean? It's 2 miles away; it's 200 miles away; it's 2000 miles away. What does it matter to me? For those students who live close to the ocean, a lake or a stream, the effect of water might be more obvious. For the student who lives on a wheat farm in the arid inlands, the word ocean is remote. It may conjure up images of surf, sand and sea gulls, experiences far removed from their daily lives; or it may have no meaning at all. Yet for that same youngster, the reality of the price of oversea wheat shipments or fuel costs for machinery are very real. The understanding of weather and its effects on the success or failure of crops is a basic fact of everyday life. The need for students to associate these daily problems with the influence of the marine environment exists. It requires exposure to ideas, concepts, skills and problem solving methods on the part of the youngsters. It also requires materials and resources on the part of our educators.

The goals of ORCA (Ocean Related Curriculum Activities) are: 1) to develop a basic awareness of ways in which water influences and determines the lives and environments of all living things; and 2) to develop an appreciation of the relationship of water to the study of the natural sciences, social sciences, humanities and the quality of life.

ORCA attempts to reach these goals by: 1) developing interdisciplinary curriculum materials designed to meet the needs of students and teachers living in Washington State, 2) developing a marine resource center, and 3) providing advisory services for marine educators. In conjunction with these efforts, ORCA is coordinating communication among educators throughout the state and the rest of the nation.

The curriculum materials are developed to be used in many areas including the traditional science fields. They consist of activity packets which fit existing curricula and state educational goals and are designed for use as either a unit or as individual activities.

The ocean affects all our lives and we need to be aware and informed of the interconnections if we are to make sound decisions for the future of the earth, the ocean and our own well being. We hope that through Project ORCA, teachers will be encouraged to work together to help students understand and appreciate the ocean and the world of water as a part of our daily existence.

ACKNOWLEDGEMENTS

The elementary series of ORCA (Ocean Related Curriculum Activities) is a product of a cooperative effort. The materials were developed at the Pacific Science Center with assistance provided by the National Oceanic and Atmospheric Administration (NOAA) Sea Grant, held by the University of Washington.

TRIAL TEACHERS

Trial teachers provide the "trial by fire." By testing the materials with students in the classroom, we learn the answer to the question: Does it work? The teachers who gave their time, effort and advice were:

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Serena Allgire	Barbara Nelson	Karin Branchflower
Vickie Dittman	Barbara MacKaness	Karen Whitner
Elaine O'Brien	Gerry Tyler	Geraldine Shelvin
Cathy Profilet	Evelyn Fairchild	Lyn Fiebig
Mary Lou Johnson	Karen Hovland	Norma Jean Howlett
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CONSULTANTS

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David Kennedy, Supervisor of Science, Environmental Education and Marine Education, Office of the Superintendent of Public Instruction

ADVISORY COMMITTEES

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Continuing guidance for the program direction was provided by the Pacific Science Center Education Committee, the members of which are:

A.D. Ayrault, Jr., Headmaster, Lakeside School
Levon Balzer, Ph.D., Dean of Instruction, Seattle Pacific Univeristy
Helen Frizzell, Teacher, Northshore School Dirstrict
Charles Hardy, Coordinator, Math and Science, Highline School District
David Kennedy, Supervisor of Science, Environmental Education and Marine Education, Office of Superintendent of Public Instruction
Roger Olstad, Ph.D., Associate Dean of Graduate Studies, University of Washington, Committee Chairperson
Alice Romero, Teacher, West Seattle High School, Seattle School District
Mark Terry, Associate Director, Environment, The Northwest School of the Arts, Humanities, and the Environment, Seattle
William Stevenson, Superintendent, Shoreline School District

STAFF

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Andrea Marrett
Manager, Marine Education Project
Pacific Science Center
200 Second Avenue North
Seattle, WA 98109

LIFE CYCLE OF THE SALMON

ABSTRACT: This unit presents important facts regarding the life cycle of salmon in Northwest waters, emphasizing the importance of clean water in our environment. It stresses the unique migration and breeding habits of salmon and relates its constant struggle for survival. This fish is one of our most important natural resources, yet the numbers of natural stock salmon are steadily decreasing in Northwest waters. This activity packet alerts learners to ways in which they can help protect the salmon's natural environment.

The student is familiarized with important terms later used in his/her own copy of the salmon's life cycle. Students will learn about the five types of salmon found in local waters and characteristics of each. They will be able to move dramatically to a suspenseful encounter of a salmon with danger. Students will help create a salmon scene for their classroom and become involved in a game that helps teach the life cycle. They also will view a slide presentation and narration of the salmon's life.

GRADE LEVELS: 3, 4 and 5

READING LEVEL: 3.7

WRITTEN BY: Kathy Tarabochia

TABLE OF CONTENTS AND OVERVIEW

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Purpose
Designed to gain student's interest and attention and involve him/ her in completing one of two suspenseful stories about a salmon's encounter with danger. Teachers may choose to ask students to move creatively in response to stories; or to complete a story by writing a dramatic ending. Interest should be created as to other dangers salmon encounter and facts about their life cycle.

Subjects
language arts, creative dramatics

ACTIVITY 2: THE INCREDIBLE LIFE OF THE SALMON (2 DAYS) 18

Purpose
Students become familiar with a word list that provides important information for understanding the life cycle of the salmon. Students are provided with individual copies of "Incredible Life of the Salmon" and have an opportunity to color diagrams throughout. This information will be an important basis for other activities in the unit. Students will complete a language arts assignment to demonstrate understanding.

Subjects
reading, language arts, science

ACTIVITY 3: HOW TO CREATE A SALMON HABITAT MURAL (2-3 DAYS) 40

Purpose
By taking part in creating a mural or bulletin board display for the classroom, students are able to use their previously gained knowledge of the salmon cycle and dangers to the salmon. They are encouraged to draw, cut-out and attach stages of the life cycle to proper locations on a landscape scene. Dangers are also attached at proper locations.

Subjects
art, science

ACTIVITY 4: GETTING TO KNOW TYPES OF SALMON (2-3 DAYS) 48

Purpose
A chart showing the 5 species of salmon enables students to discover facts about the species of salmon native to the Northwest. By answering questions on a fact sheet, they make use of their salmon chart and are able to keep it as a valuable resource. This activity will acquaint students with the various types of salmon and how to tell them apart at the grocery store or a nearby stream.

Subjects
mathematics (chart reading), language arts, science

PAGE

ACTIVITY 5: LIFE OF THE SALMON: SLIDE PRESENTATION AND NARRATION (1 DAY)

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Purpose

A slide presentation and narration will visually show students the stages a salmon goes through during its life. Unique pictures include slides taken inside a gravel bed after salmon eggs have been laid and fertilized, the tiny form of life that emerges from the egg, and the vibrant colors of the sockeye salmon as it returns to its place of birth. Slides also include environmental photographs that demonstrate erosion and ways in which students can help keep water clean.

Subjects

science, language arts

ACTIVITY 6: SALMON JOURNEY (1-2 DAYS)

80

Purpose

Students of different grade levels will experience part of the life cycle of the salmon by going through an obstacle course that can be set up at your school (perhaps for a fair or special event). By traveling through the "hazards" involved in the Salmon Journey, the student will better comprehend the unique qualities of this native fish. The student will be able to experience first hand the salmon's struggle in returning upstream to the place of its birth to spawn. Students are also acquainted with the different species of salmon found in Northwest waters.

Subjects

science, art, mathematics, reading

ACTIVITY 7: STREAMLINED ANIMAL (3 DAYS)

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Purpose

This activity could be set-up as separate stations for students to explore on their own, or done by the class as a whole. The salmon's body is well adapted to its water environment; each part of the fish serves an important function. In this activity, students explore the salmon's streamlined body, its field of vision, and its use of fins for movement, muscles for strength, scales for protection, and gills for breathing.

Subjects

science, language arts, reading

ACTIVITY 8: BUILD A SALMON FACT BOX (2-3 DAYS)

102

Purpose

Students will use the information gained in previous activities to create a salmon fact box. This fact box will contain questions about such things as the salmon's adaptation to its environment, the dangers facing a salmon, and migration patterns during a salmon's life cycle. The fact box, while allowing students to review information independently or with a classmate, could also serve nicely as a classroom display.

Subjects

science, language arts

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PEOPLE, PLACES AND THINGS: A RESOURCE LIST

PAGE 106

Purpose:
The resource list provides a description of an additional number of activities and field trip sites for students studying Salmon. The list gives contact names and phone numbers where possible.

EVALUATION, VOCABULARY AND BIBLIOGRAPHY

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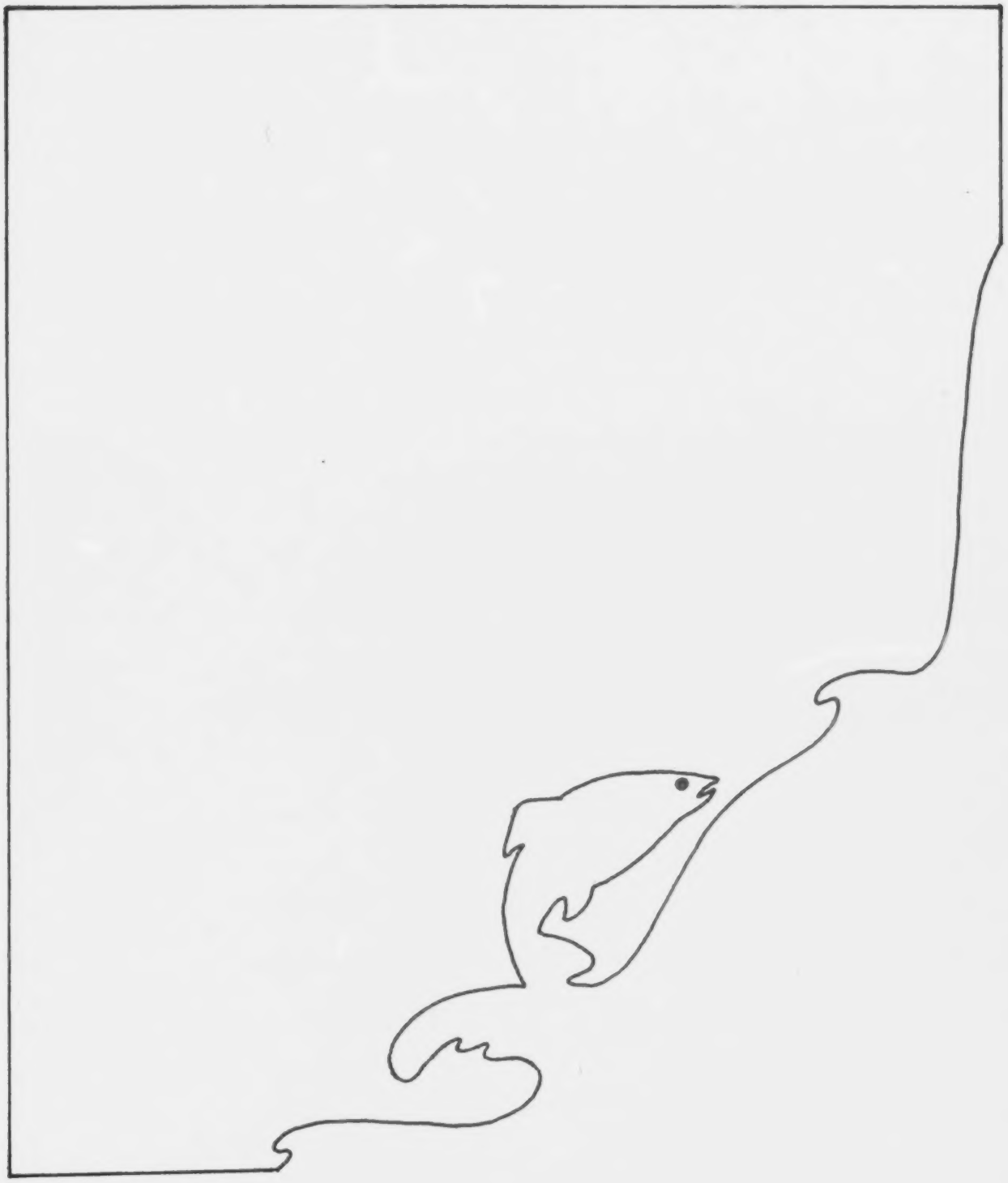
PLAN AHEAD

1. Contact the Marine Education Office at the Pacific Science Center (625-9333, extension 203) and arrange for use of slides (for Activity 5) and fish egg samples; they are available on a two week loan basis. They will also supply you with a helpful poster for the classroom, "Anadromous Fish of the Pacific Northwest." This illustrates the five species of Northwest salmon in the adult and spawning stages of their lives.
2. Contact the Office of Education at the University of Washington Department of Fisheries (543-4583) to obtain several classroom copies of the booklet, "Pacific Northwest Marine Fishes." This will be an excellent resource and learning aid for Activity 4, "Getting to Know the Types of Salmon ."
3. Make overhead transparencies of any diagrams you may wish to project.
4. Make copies of student handouts.
5. Experiment yourself with those activities you plan to have the students do.
6. Read teacher background information.
7. If planning to use Activity 6, "Salmon Journey," make arrangements for the necessary space and materials for the obstacle course. You may wish to contact the Marine Education Office to obtain the elementary teaching kit, "Salmon Journey Game" which provides all the materials for that activity. Please call for specific information regarding the kit.



ACTIVITY 1:
TERRORS UNKNOWN
(1-2 DAYS)

ACTIVITY 1: TERRORS UNKNOWN (1-2 DAYS)

CONCEPTS: A salmon's life is full of danger.

OBJECTIVES:
1. Students will develop an awareness of the life of the salmon as a result of listening to Story A or Story B.
2. Students will learn about one of the dangers a salmon encounters in its life.
3. The student will respond to the passage read by the teacher by completing the story in his/her own words.
4. The student will demonstrate his/her familiarity with salmon by completing the pre-test.

TEACHER PREPARATION:
1. Read Teacher Information Sheet, "Terrors Unknown."
2. Become familiar with Story A and Story B. Both stories were written to create the same effect or setting; the goal is to "grab" the listener's attention and stimulate his/her interest in the life cycle of the salmon. This activity is simply a means to an end - not a lesson in itself. It will be your choice whether to use "Story A" or "Story B."

   Story A is about the predator/prey relationship. An adult salmon encounters a killer whale, becomes clenched in its jaws and is then mysteriously released to freedom.

   Story B uses the theme of pollution to convey its message. A small salmon swims into a polluted stream, has a close call with death, but is able to swim free.

MATERIALS:
1. Duplicate 1 copy of pre-test per student.

PROCEDURES:
1. Introduce this first activity by telling students they will need to listen carefully to a story about a salmon. Ask students to be very quiet and imagine they are the fish.

2. Read Story A or B until you get to the word "STOP."

3. Ask students to take out a piece of paper and pencil and complete the story, asking: "What was the danger in the water?" and "What will or could happen next?" (Allow 15 minutes.)

4. Now have students turn over their writing papers and listen to the rest of the story.

5. Discuss:
   A. A whale (or pollution) is one danger to the salmon - can students think of others?
   B. Other dangers: bears, seals, foxes, sea birds, fishermen with large nets, fishing, rivers filled with silt and dirt from erosion, streams no longer shaded by overhanging foliage, improper care of water resources, i.e. oceans, lakes, rivers, streams, bays and estuaries, by all people.

C. The salmon's life is unique - do students know why? Inform class they will find out why in a later activity.

6. Distribute pre-test. Explain that this activity will indicate what students already know and what they would like to learn about the salmon.

7. Allow students to take pre-test and complete all questions.

8. Make a list on the board of student responses to questions 11 and 12. Discuss.

9. Ask students to exchange papers and correct pre-tests as a class. (optional) Be sure to monitor and check responses.

10 You may wish to make two copies of pre-test per student; use it at the end of the unit to show students what they learned. There is another evaluation provided.

EXTENDED ACTIVITIES:

1. Discuss with students the story they listened to about the salmon. Review important facts.

2. Inform students that they will now be able to listen to another tale about the danger a salmon faces in its life.

3. Select four to eight students to stand in front of class (or in the center of a circle) with the rest of the students seated. Ask them to use creative movements to portray the story they are listening to. Read either "Story A" or "Story B" again.

4. If "Story A" was read previously, now read "Story B" and vice versa. Do not stop the story in the middle this time.

5. Ask students to compare the two stories.

6. Ask students: Which danger is the greatest threat? Why? What things can cause pollution of rivers and streams? (See Teacher Information Sheet, "Terrors Unknown.")

Teacher Information

TERRORS UNKNOWN

Story A describes the way in which a killer whale would capture a salmon to eat it. This passage relates the natural predator/prey relationship. The killer whale was used as the predator for two reasons: 1) This animal is indigenous to the Puget Sound area (students are somewhat familiar with it). 2) The killer whale does feed on salmon, although not exclusively.

You may not wish to read this story because of the negative feelings it may create toward whales. If you feel that students may react to the whale as "bad" or "cruel" because of this story, you may wish to use Story B. Review both stories to see which is more appealing, or which meets your needs.

Story B describes pollution as a danger to fish (young or old). After the story, you may want to discuss with students how man pollutes oceans, lakes, streams and rivers. Some of the ways would be:

1 Storm water run-off: the greatest threat to salmon now. By constantly clearing land for new housing developments, shopping centers, highways and roads, we lose the natural ground cover that absorbs rain water. Without natural absorption, water run-off in rivers and streams is much faster. This creates problems. The swift flowing water can do two things: it can wash the eggs out of the gravel; it can also cut deeper into river banks and river beds. Erosion of surrounding earth will occur and large amounts of silt will wash through the waterbed. The silt will cover salmon eggs and suffocate them; also it will cut off oxygen for other fish.

2. Cutting back natural foliage: takes away natural shade and raises water temperature of the stream or river. This also takes away bushes where bugs live that small fish feed on. Again, lack of foliage increases the chance of soil erosion.

3. Bulldozers and land movers: dump dirt into streams and riverbeds.

4. Oil on roads and exhaust from cars: filters or washes down to the water beds.

5. Inserting culverts and pipes into streams: takes away the natural habitat for small animals and fish.

6. Humans throw litter into the water: we have seen shopping carts, tires, shoes, cans, bottles, plastic containers, etc. in water areas used by humans.

7. People use gullies, ravines, or drain pipes as garbage dumps: lawn fertilizers, lawn clippings, pesticides, and oil from cars are all dumped into waterways, endangering wildlife.

8. Chemicals and waste products: dumped into the water from factories also endanger wildlife.

STORY A - TERRORS UNKNOWN

You are one of natures most beautiful and unusual animals.
You have a long, sleek body that is built for speed and motion.
Your coloring is an iridescent silver.
You have keen eyesight.
Your hearing enables you to sense noise from up to a mile away.

It is cold and clear in the deep water.
Several small forms pass by you silently.
A large dark shape off to one side catches your attention.
Then the gentle swaying of flower shapes in the water current and a luxurious floating bell come into view.
It is a quiet, peaceful morning.
All is calm.

Off in the distance a swishing, sweeping sound can be faintly heard.
Sinking to a lower depth you can sense a great motion coming toward you.
You can see nothing.
Again the swishing, sweeping noise; this time it grows louder and louder.
Closer and closer.
Still you can see nothing.
Your natural instinct senses danger.
You wait, looking all around.
Other fish rush past, hurrying to go somewhere.
Small bits of green swirl in the movement of the water.

The swishing, sweeping noise stops.
There is <u>silence</u>.
It is an eerie silence.
You swim a little deeper to where another group of fish are swimming about lazily.

Suddenly the water explodes around you.
There is a violent thrashing and thundering movement.
<u>STOP</u>

Teacher Information

You turn quickly to see a large black and white head open its jaws and capture the small group of fish next to you.

As this monstrous creature rushes by, you realize the danger has not yet passed.
It is a killer whale.
The whale makes a slow turn and with lightning speed rushes toward you.
You swim lower and quickly angle off to one side.
Then you feel the pressure of a strong force moving you through the water.

You see a row of giant, sharp teeth and feel your skin being tugged at.
You can feel your skin tearing and see blood in the water.
Still your body is being pushed through the water with a violent thrust.
The whale has you between its jaws.

Then it is over . . .

With one powerful, jerking motion, you are thrown out into the water as the whale again opens its jaws and lunges toward a <u>new</u> victim.
Your body is aching and sore.
You have just escaped death.
The killer whale is a ferocious hunter.
You had <u>almost</u> been crushed in its jaws.
Next time you might not escape . . .

STORY B - TERRORS UNKNOWN

You are a shiny, streamlined baby fish that is only six inches long.
You have light, wispy markings on your sides.
You can dart about quickly in the water and move with great swiftness.

It is early in the morning.
The sun has just peeked out from behind the tall, swaying trees.
As you swim about the delightfully cold water, your stomach tells you it is time for breakfast.
The water gurgles and races beside you.
It is time to eat and time to watch for small bugs on the top of the water.
There's one!
You make a quick, agile leap and snap! you've got him.
Your natural instinct says, let's find more!

Slowly you swim downstream.
You enjoy the icy water.
The swirling, churning motion gently tickles your sides.
You can clearly see a little water snail sliding along below you.

The water begins to get warmer as you travel downstream.
You look for bushes and branches of drooping trees to find another fly.
You cannot find any.
The water now is murky with a light brown tinge.
It is more difficult to see ahead of you.
Maybe the cloudy water will end soon.
You begin to notice the water is moving very slowly.
The water is so warm it becomes uncomfortable.
There is a funny smell all around you.
You sense danger.
It is becoming difficult to breathe.
The water is covered with algae scum and it's harder to swim.
Somehow you must keep going.
You must keep going.
STOP!

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Teacher Information

Your eyes begin to sting as you pass through the water.
Your skin is irritated and it itches.
You slowly swim to the surface to gasp for a breath of air.
It is difficult to see; you bump into a large, rusty object buried in the mud below.
You scrape the side of your body badly.
You are feeling weaker and weaker.
A thick oily substance clings to your fins.
Moving about becomes more difficult.
You feel like you're suffocating.
You must keep fighting, but you are so tired - so very tired.
You stop where you are . . .

Then it is all over . . .

You just passed through an area of a stream that was polluted by humans.
You tried to breathe in water that was filled with dirt and mud.
Water that had oil, chemicals, and old rusty cans.
You were strong enough to survive the unclean water - just barely!

Next time you might not be so lucky.

Life of the Salmon - Pretest

Please circle True or False.

1.	Some salmon are red and green.	(True)	False
2.	A salmon lives only in the ocean.	True	(False)
3.	A salmon is not good for people to eat.	True	(False)
4.	Salmon go through several stages of development in their lives.	(True)	False
5.	Salmon babies are called redds.	True	(False)
6.	Whales and sharks never eat salmon.	True	(False)
7.	A salmon can swim upstream, against the water flow.	(True)	False
8.	A salmon baby can always live in polluted, unclean water.	True	(False)
9.	A salmon is always silver in color.	True	(False)
10.	Fishermen like to catch salmon with large nets.	(True)	False
11.	The numbers of salmon that spawn (or complete their life cycle) in Puget Sound are getting fewer and fewer.	(True)	False
12.	Salmon can jump 11 feet out of the water.	(True)	False

Fill in the blanks:

13. List two important things you already know about the salmon.

    a. *(answers will vary)*

    b. *(answers will vary)*

14. What is one thing you would like to know about salmon?

NAME _____

Life of the Salmon - Pretest

Please circle true or false.

1.	Some salmon are red and green.	TRUE	FALSE
2.	A salmon lives only in the ocean.	TRUE	FALSE
3.	A salmon is not good for people to eat.	TRUE	FALSE
4.	Salmon go through several stages of development in their lives.	TRUE	FALSE
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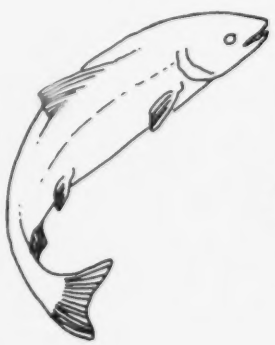
Fill in the blanks:

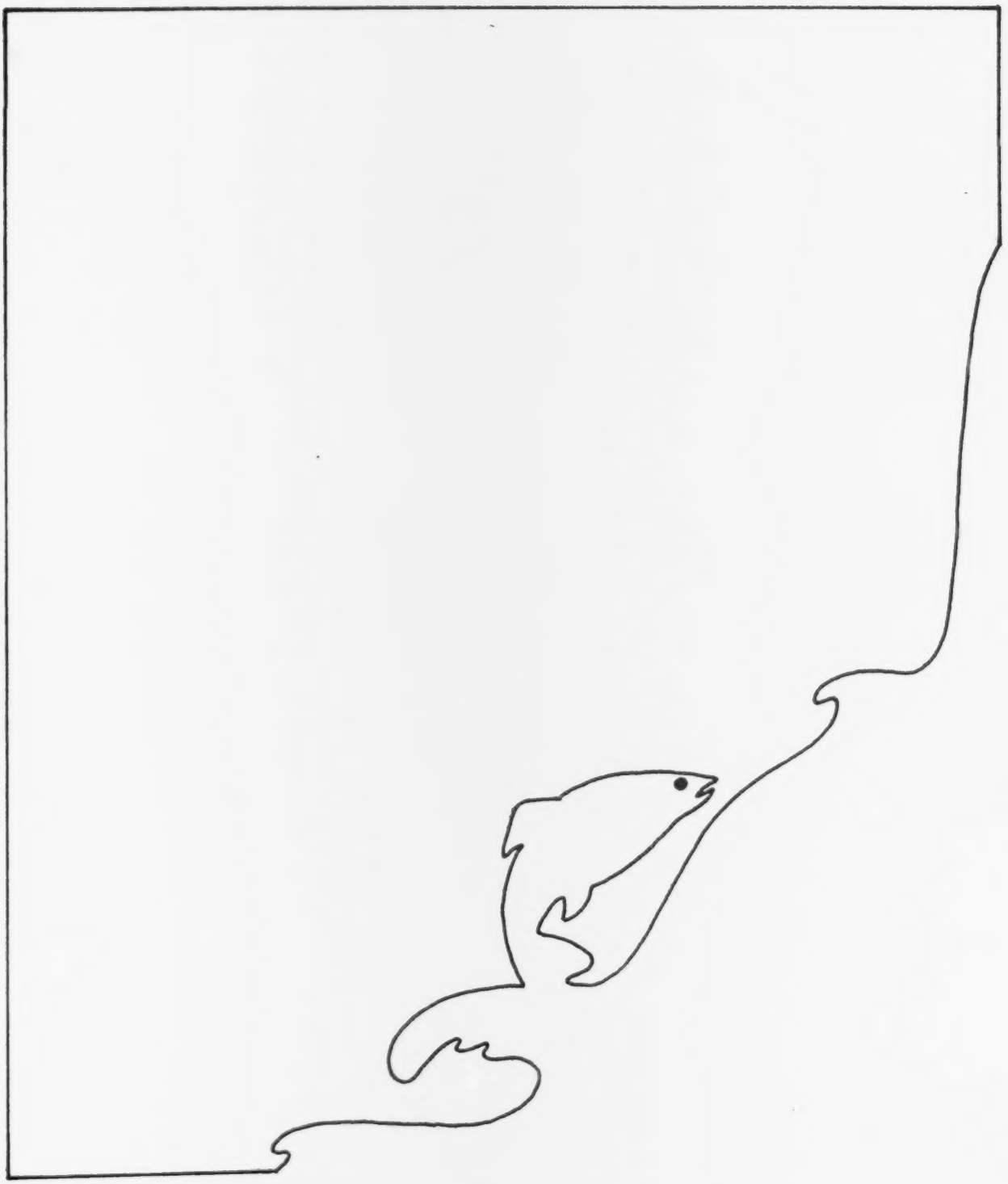
13. List two important things you already know about the salmon.

    a. _____

    b. _____

14. What is one thing you would like to know about salmon?





ACTIVITY 2:
THE INCREDIBLE LIFE OF THE SALMON
(2 DAYS)

THE INCREDIBLE LIFE OF THE SALMON (2 DAYS)

1. The salmon's life cycle is one of nature's wonders.
2. We can each help keep water in oceans, lakes and streams clean.

OBJECTIVES:

1. Students will become familiar with the Student Handout, "Word List."
2. Students will become familiar with the story, "The Incredible Life of the Salmon."
3. Students will demonstrate understanding of the life cycle of the salmon by completing the Student Worksheet, "The Salmon Story." (evaluation)

TEACHER PREPARATION:

1. Read Teacher Information Sheet.

MATERIALS:

1. class set of "Word List"
2. class set of "The Incredible Life of the Salmon"
3. class set of "The Salmon Story"
4. class set of "Words We Remember"

ACTIVITY 2:

PROCEDURES:

1. Distribute Student Handout, "Word List" to students and discuss words and their meanings.

CONCEPTS:

2. Distribute the story, "The Incredible Life of the Salmon" and allow class to read completely. Those who finish first may color diagrams.

3. Discuss with students: four major stages of the salmon's life, three ways we can keep water clean. Allow students to provide answers; you might make a list on the board.

4. Distribute Student Worksheet, "The Salmon Story" and ask students to complete it.

5. Collect stories as they finish. This will act as an evaluation to see how well they comprehend the information. (Not a formal evaluation.)

6. (optional) Ask students to complete "Words We Remember."

EXTENDED ACTIVITIES:

1. Play "Ask the Experts" with a panel of four students in front of the class without their salmon information. The rest of the class members may ask a question of any one panel member. If the panel member correctly answers the question, he/she remains on the panel; if not, the person asking the question will take his/her place. Students in the audience may use their salmon stories and word lists for reference.

2. Make an effective bulletin board display by using an opaque projector to enlarge the following scene on a large piece of white butcher paper. Students may trace the outlines and then take part in coloring with water colors, tempera, felt pens, crayons, etc.

FACTS ABOUT THE SALMON

1. The female salmon lays some 3,600 eggs. On an average, only two of those eggs will complete the life cycle and survive to be adults.

2. Salmon like cold water. Some pollution heats the river water to 85 degrees. This is 7 degrees warmer than any salmon can survive.

3. Salmon hatcheries are located all over the state of Washington to help some types of salmon reproduce.

4. Hatcheries maintain domestic stocks of salmon to supplement the number of salmon available to fishermen. In some cases, these are placed in streams to start a natural run. In general, hatchery stocks are not the same as wild stocks.

5. Here is a quick run-down on the salmon's life cycle. It is important to remember that there are various species of salmon and each one's life cycle is a little different.

   Life begins in a cold shallow inland stream when it hatches from a small red egg the size of a pea. (If eggs have not been smothered with silt.)

   Salmon eggs stay in the nest for two to six months. Nature has provided it with a yolk sac that supplies its nourishment for the first few weeks. At this stage it is called an alevin (AL-e-vin).

   Soon it emerges as a small fry. It spends its time alternately hiding and searching for food.

   A few months later it will leave the quiet waters of the shallow river and wander downstream. It will feed on microscopic plants and animals. It grows rapidly and is four to five inches long by the time it reaches the mouth of the river and salt water. The salmon's body must now adapt to the saltwater environment; several days are spent at the mouth of the river as the fish adjusts to salinity. Having reached the sea, its diet will gradually change and food is plentiful. For the next two to four years, it will swim hundreds of miles offshore, escaping from hazards and natural predators.

   As it matures and returns to the stream of its birth, its habits and general appearance undergo many changes. Its jaws (especially the males') become longer and develop a ferocious-looking hook at the end. This hook can be effective in the eventual mating process (i.e., fighting other competitive males).

When its life in the ocean ends, nature recalls it to its birthplace. Some mysterious homing instinct drives it to swim toward shore to seek the mouth of the exact river in which it was born.

Once it enters fresh water, the salmon feeds no more. During the next several weeks or months, until the spawning cycle is over, it will live only on the reserves of fat stored in its plump body. So strong is this mysterious urge that the salmon is driven on to unbelievable tasks. Nothing short of death can stop it. Neither rapids nor waterfalls, seething torrents nor swirling whirlpools can stop it. Should it come upon a waterfall, it will often leap as high as eleven feet to overcome it. If it doesn't make it on the first leap, it continues to leap again and again, until it either passes this barrier or falls exhausted at its base.

When salmon migrate to their birthplaces at spawning time, the male becomes quite easy to distinguish from the female. Not only does the male have the hooked snout, but it develops a very noticeable hump on its back. Some species change color more conspicuously than others, such as the sockeye, which becomes bright red and green.

In spite of the many hazards, dams, areas of polluted water, and the relentless harvest of fish by men, birds, and even bears, some of the salmon miraculously complete the journey to their spawning areas. Experiments with tagged fish indicate that a salmon finally makes its way to the stream where it was born. Although the salmon passes many suitable streams on its journey upriver, it does not leave the school of migrating fish until it reaches its home stream. One to five percent of hatchery produced stock return to spawn.

How does the salmon find its way? Experiments seem to indicate that salmon may smell their way to the proper stream. The water in each stream seems to have a distinctive odor which is different from that of any other stream. The odor is produced by the kind of plants that grow in the water and the type of land the stream crosses.

In one experiment, several fish captured from their spawning stream were released downriver from its mouth. Half of the fish had their nostrils plugged; the other half did not. As they swam upstream once again, the fish with unplugged nostrils turned off when they came to the spawning stream. The fish with plugged nostrils could not smell the water flowing from the side stream and swam on past. In an experiment done by the Seattle Aquarium using morpholine to label the water and imprint the salmon, they had an early return of chinook and coho to their artificial spawning channel.

When the male salmon finally reaches its destination along with the hundreds of other salmon, it watches one of the females scrape a shallow nest (called a redd) in the gravel of the stream bottom. After she scatters several thousand red pea-sized eggs in the hollow, the male showers them with milt which contains the sperm needed to fertilize the eggs. When this mission has been accomplished, the journey is ended and the spawning over. Spent adults usually guard the redd before they die. One male may fertilize eggs from as many

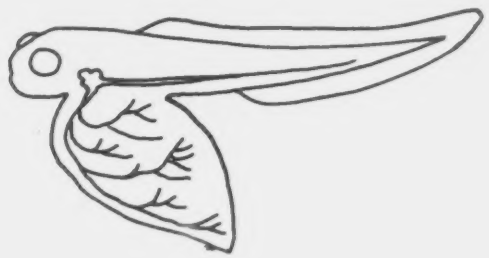
as five female salmon. Scarred and half starved, the salmon drift listlessly downstream where they soon die.

But next year and the year after that, even many years to come, new generations of salmon will return from the sea to spawn and die in the streams where they were born. For centuries, the fate of the salmon has been bound to the endlessly flowing rivers. Like hundreds of other wild creatures that live in running water, they will continue to flourish only so long as their rivers flow unpolluted and reasonably free of man-made obstructions.

NAME _____

WORD LIST

1. Alevin: (al-e-vin) Newly hatched salmon with its yolk sac still attached to its body.



2. Anadromous: (a-nad-re-mes) Any fish that is born in fresh water but lives most of its life in salt water. A salmon is anadromous.

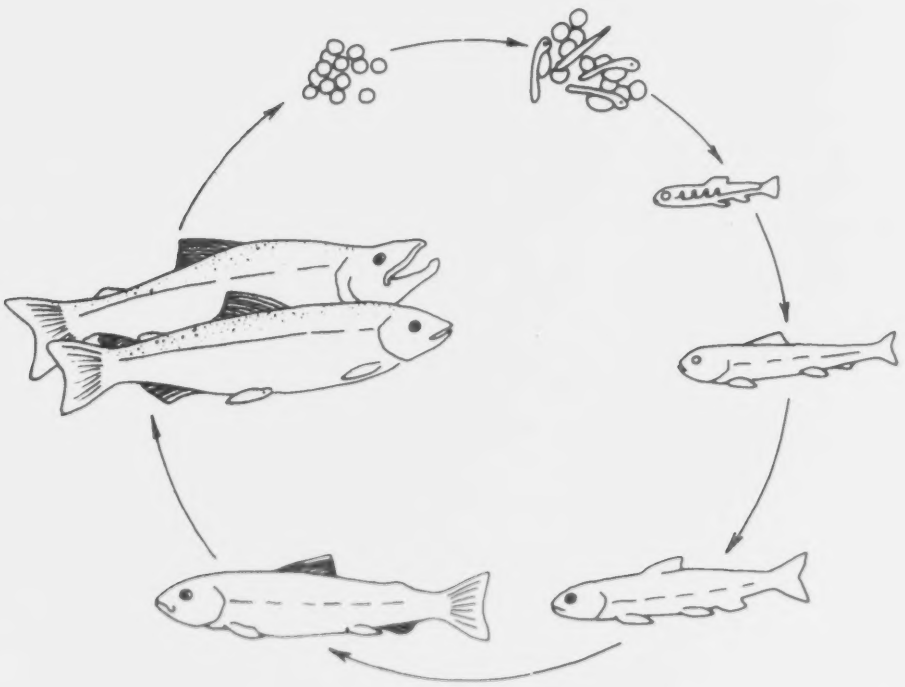
3. Erosion: When rock, dirt, or soil is moved from one area to another by by natural forces.

4. Fingerling: An older Pacific salmon that eats small plant life and lives in a stream.

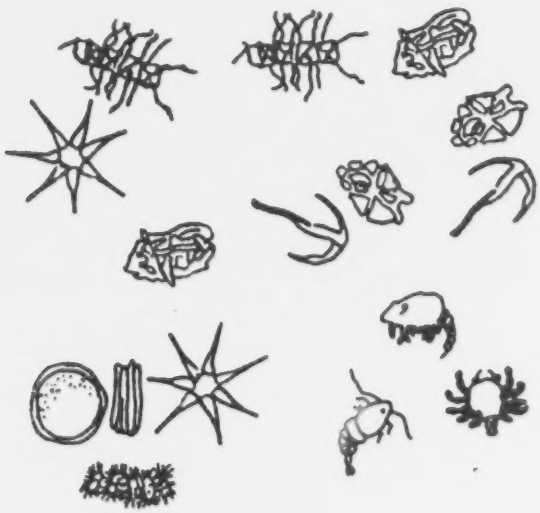
5. Fry: Salmon young that have used up their yolk sac and have gone from the gravel bed and are ready to feed.

6. Habitat: The area or type of environment in which an animal normally lives.

7. Life Cycle: A kind of circle of life. When the stages in life of an animal's life are repeated over and over again. Young salmon become adults. Adult salmon produce young salmon. Those young salmon become adults and so on.



8. Plankton: Very tiny plants and animals that live in the sea. They are food for other sea animals.



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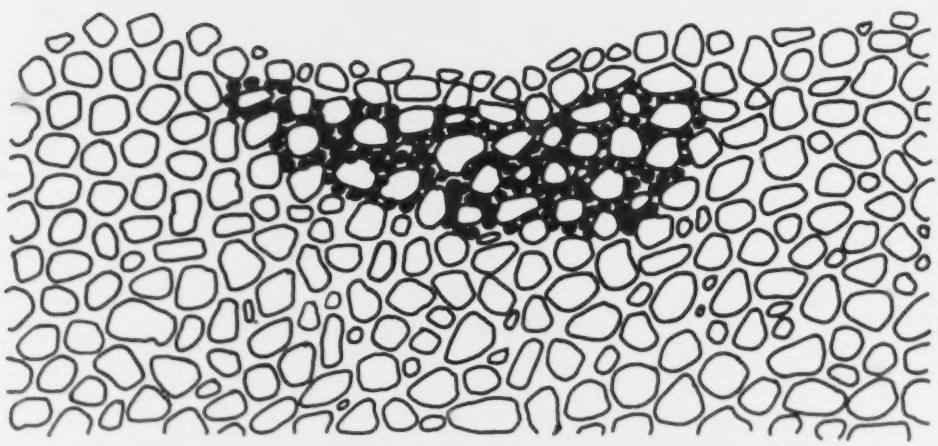
9. Redd: A round hole in a gravel bed where salmon eggs stay for about 8 weeks covered by loose gravel.



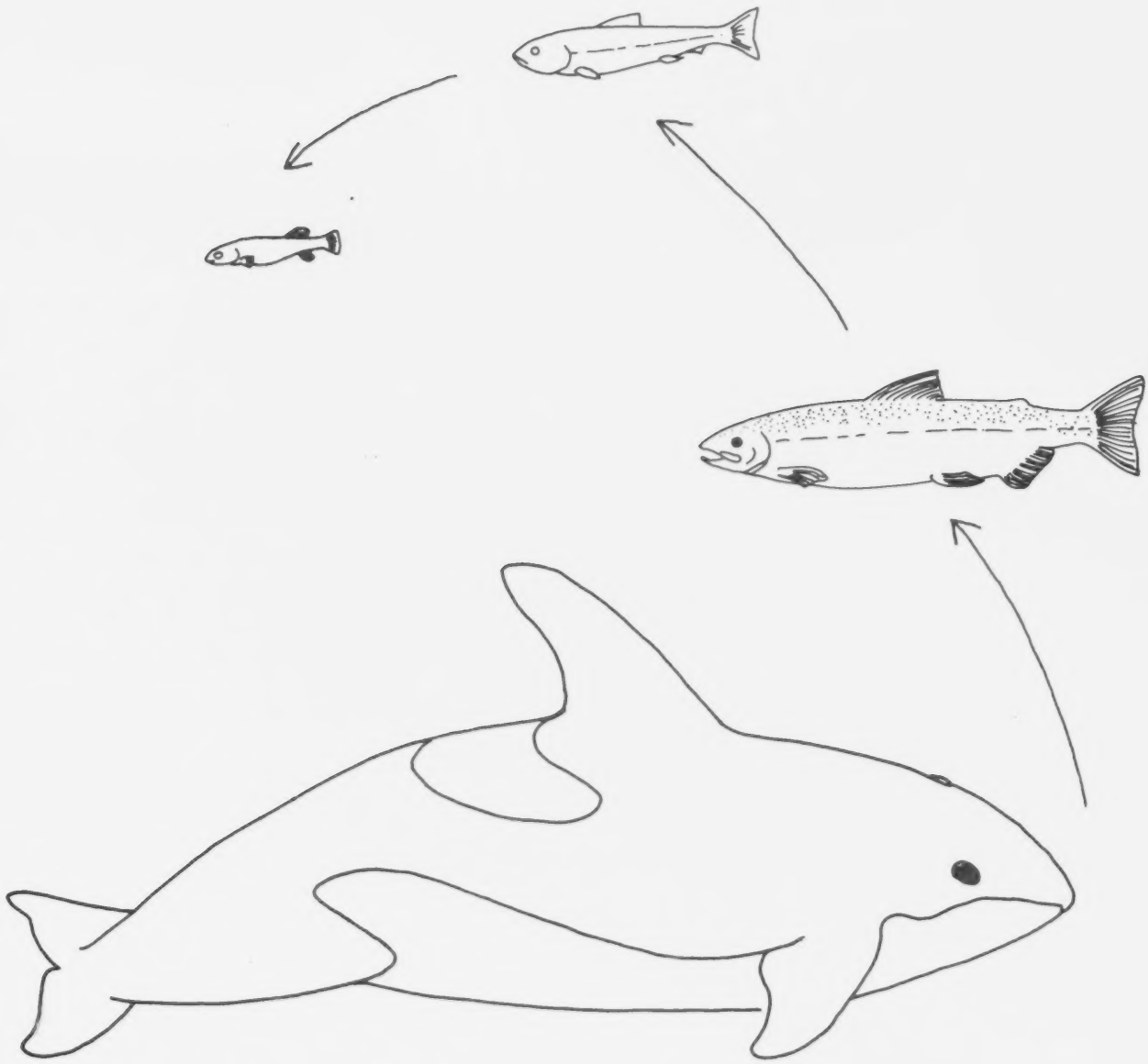
10. Smolt: A young salmon ready to go to sea. It is silver in color.

11. Spawn: To lay eggs.

12. Species: Different types or kinds of animals. For salmon, those that look different and live for different lengths of time; we have five species in the Northwest.

NAME _____

13. Trophic Scale
or Food Chain: The scale or pattern of who eats whom in the animal kingdom, the chain of eat and be eaten.



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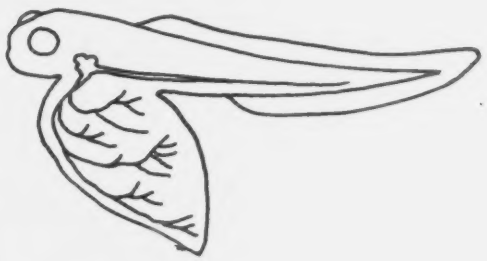
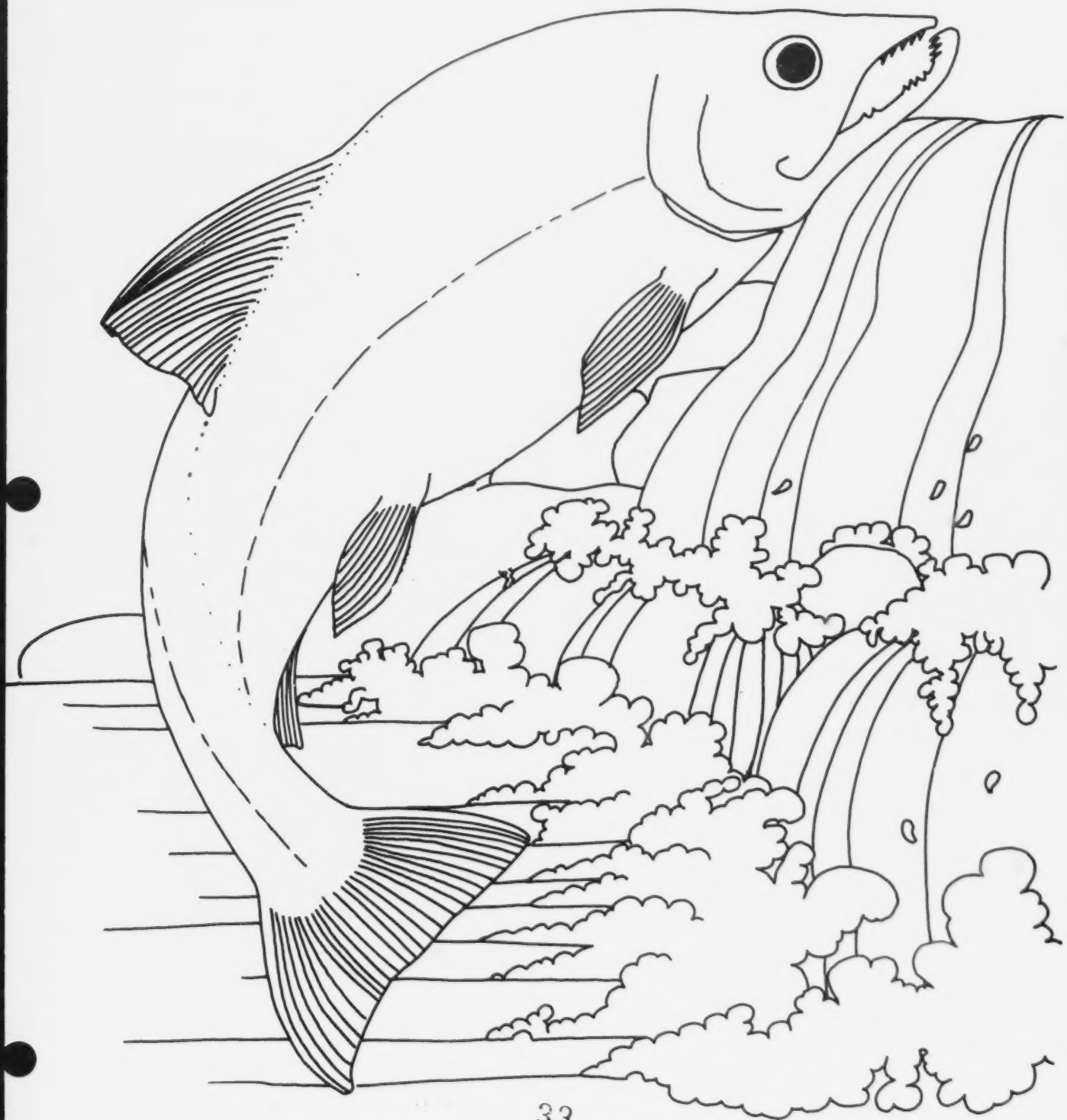
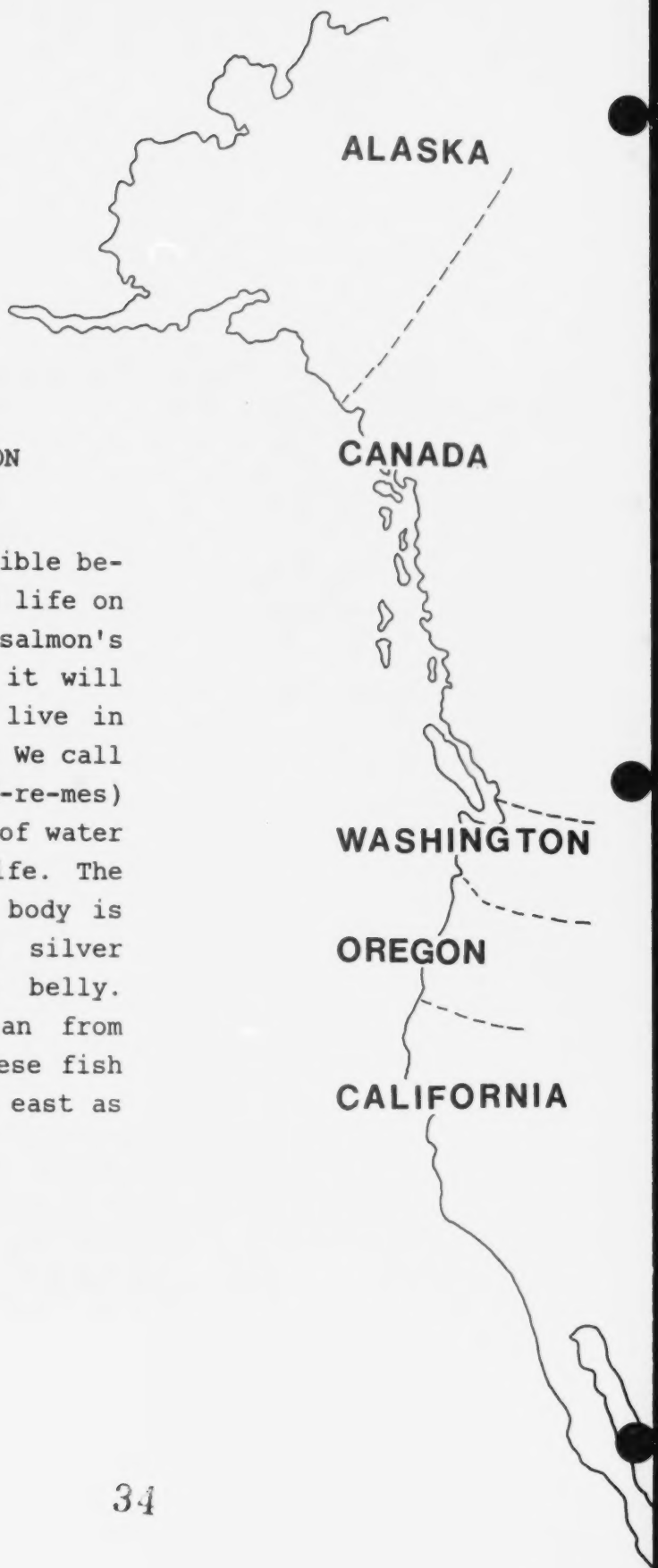
14. Yolk sac: The small sac that is attached to the baby salmon. This provides all of the food to the baby before and after it is hatched.



THE INCREDIBLE LIFE OF THE SALMON

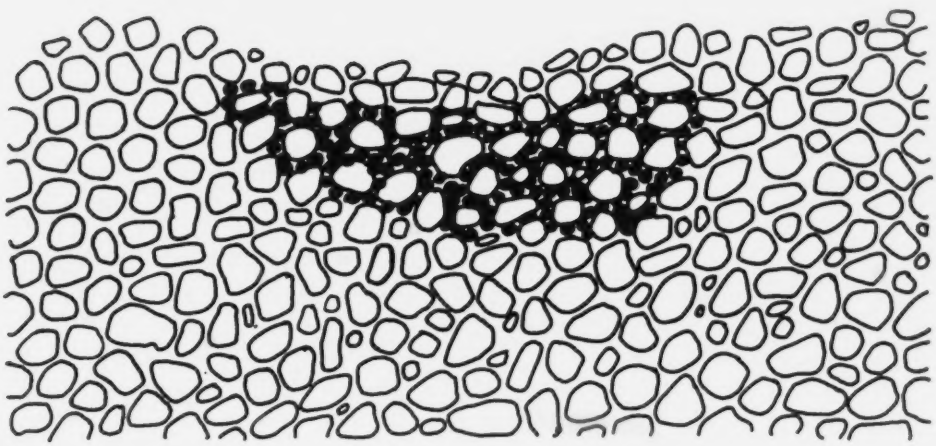




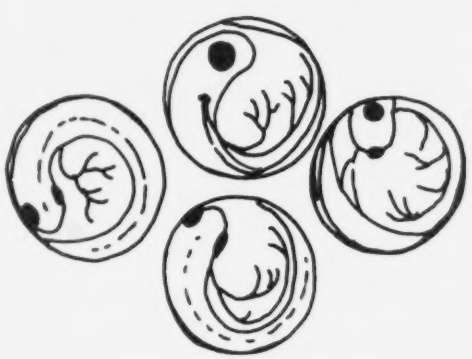
THE INCREDIBLE LIFE OF THE SALMON

The story of the salmon is incredible because a salmon spends most of its life on a journey. On this journey, the salmon's body goes through many changes; it will encounter many dangers and will live in both fresh water and salt water. We call the salmon anadromous (a-nad-re-mes) because it can live in both types of water at different times during its life. The salmon is a strong animal. Its body is long and sleek with beautiful silver sides, a dark back and light belly. Salmon live in the Pacific Ocean from Alaska to California. Some of these fish have been known to travel as far east as Asia.

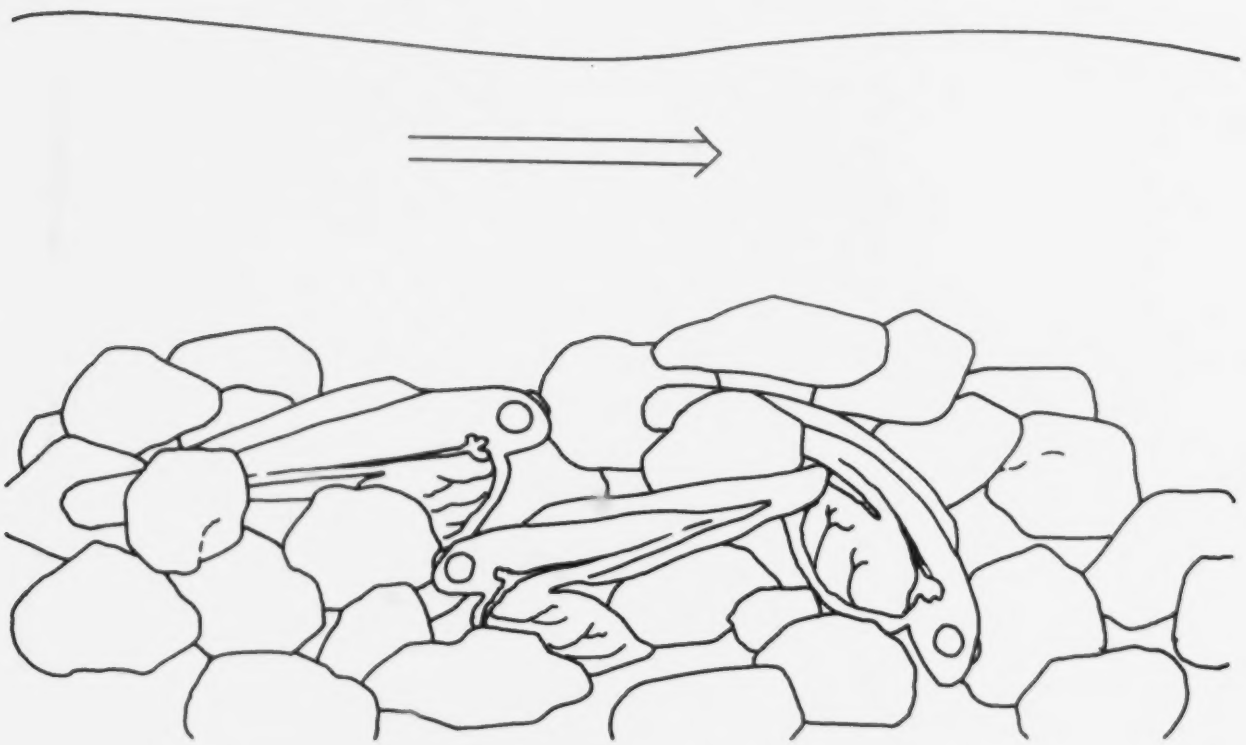
For a salmon, life begins at the bottom of a shallow, freshwater stream in a bed of gravel. Small salmon eggs, the size of a pea, are clustered in groups and rest just under the top layer of gravel. This first home is called a redd.



The young salmon is growing inside the egg. This may happen in late fall. When the young salmon inside the egg reaches the stage shown below, it is almost ready to hatch. It will remain inside the egg a while longer.



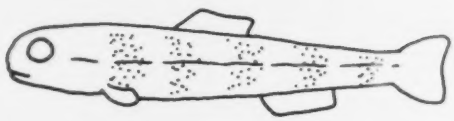
WHAT DOES THE SALMON LOOK LIKE WHEN IT IS HATCHED?



When the baby salmon hatches from the egg, it is only about an inch and a half long. Its body has a small sac that supplies it with food for many weeks. This is called a yolk sac and is located underneath the fish's body. This small fish is called an alevin and soon it will be able to eat small plant particles in the water. Many small salmon swim together in the stream where they are born.

As the salmon grow larger, they swim greater distances in the river. Their bodies grow longer and they begin to look like adult fish.

WHAT DOES THE SALMON LOOK LIKE NOW?



At this stage the baby fish is less than a year old and is called a fry. It has marking on its sides so that it can hide (from enemies) along the river banks.

The fry will spend most of its time searching for food. It feeds on water insects and other small animals in the river. After a few months the little fry will start to wander down stream.

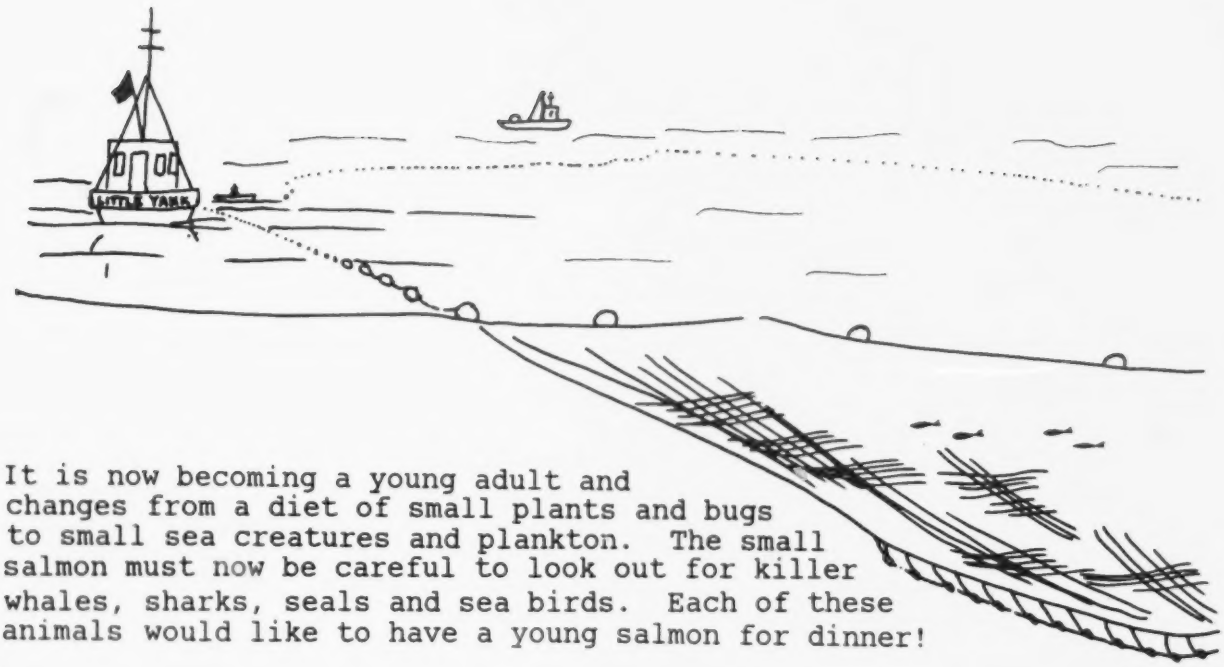
It is now from two to four inches long. Along with many other baby fish, it has started a journey that will last the rest of its life. While the young salmon is traveling, it will come across many new dangers. Larger fish, birds and wild animals will want to eat the salmon fry. Many rivers are polluted by man, and this too can cause death. The baby fish must have clean water to survive. This fresh-water home is called a habitat.

As the fry live in the rivers or lakes they continue to grow and soon they are fully developed young salmon called smolt or fingerlings.

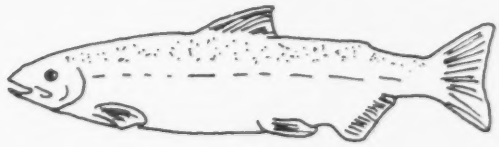
The salmon smolt is about two years old and is over five inches long. It has a shiny, silvery coat and has lost all of the dark marking that helped it to hide in the river. Now the fish will feel a strong urge to find its way to the open sea. The smolt travel in groups searching for the salt-water that will be their next home; however, not all of these fish will reach the sea. Hungry bears, wild foxes, birds or polluted water due to erosion may cause it to die.

Having reached the sea, the young salmon find that life is very different. There is a lot of food and the ocean is very salty!

IS THE SALMON FREE FROM DANGER NOW?



It is now becoming a young adult and changes from a diet of small plants and bugs to small sea creatures and plankton. The small salmon must now be careful to look out for killer whales, sharks, seals and sea birds. Each of these animals would like to have a young salmon for dinner!



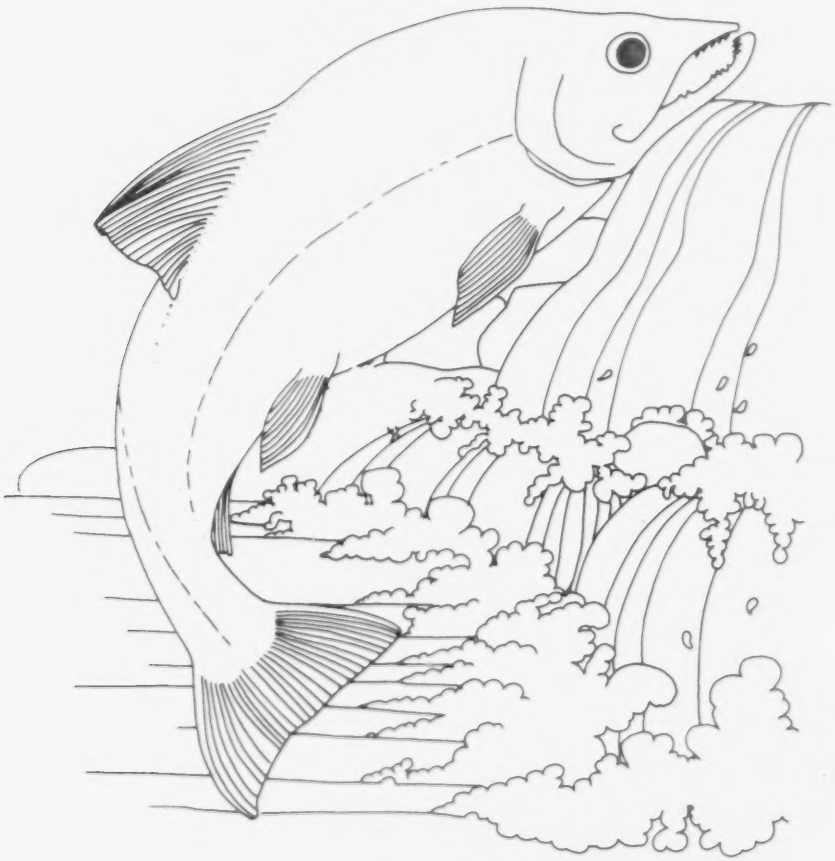
As it grows older, its body will keep changing. The adult salmon has a larger face and jaw than the smolt. Its body is becoming heavier and more muscular; it can now swim much faster than before. As an adult, the salmon will spend from two to five years in the ocean. There are five types, or species, of salmon in the Northwest and each type spends a different amount of time at sea. During this time a salmon will swim hundreds of miles and stay by itself, rather than with a group. It swims throughout Puget Sound and the Pacific Ocean.

The greatest danger to the salmon now will be the fishermen with large boats and nets; and fishing poles with hooks and lines.

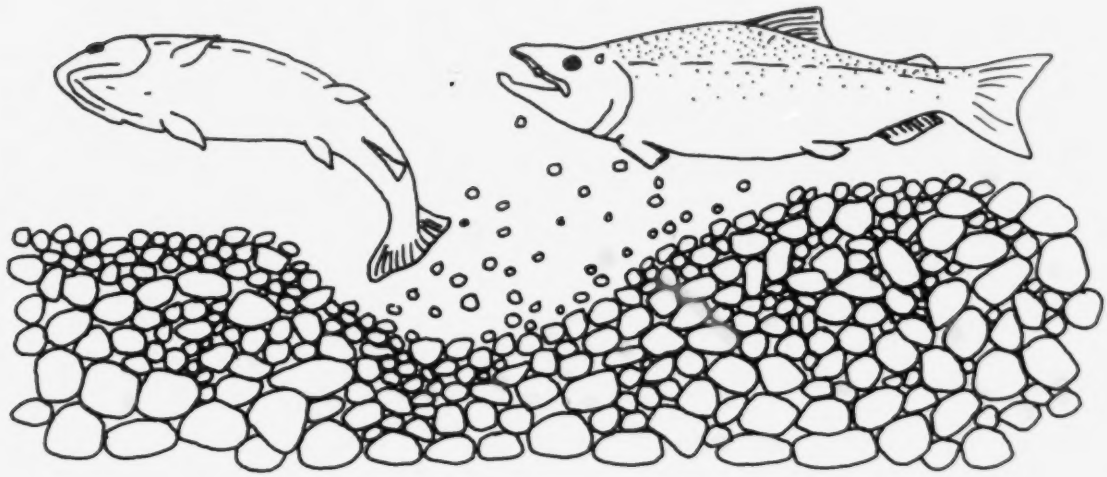
The adult salmon continues to grow larger and stronger. Each fish will need as much strength as possible for it is almost time for it to begin its trip back to its birthplace. The salmon has a type of instinct that tells it when it is time to start searching for the stream of its birth. The search will be slow and it will face many more dangers.

A salmon has a wonderful sense of smell; this will help it find its home. While in the ocean, each salmon will swim seven to ten miles a day until it reaches the mouth of the river where it was born. When swimming back up the river, it may only travel one mile a day and will need to rest often. It will actually swim against the mighty rivers trying to find the exact location of its birth. The salmon is smelling its way. The water in each stream seems to have a special odor which is different from that of any other stream. The odor is made by the kind of plants that grow in the water and the type of land the stream crosses.

Along the way it may encounter a dam in the river or a fish ladder (as in Lake Washington) but none of these things will stop salmon from attempting to continue their journey upstream.



WHAT DOES THE FISH DO WHEN IT FINDS ITS HOME?



The salmon is no longer eating now; its only thought is to make its way home to spawn. Many fish are now swimming together up the rivers. When the male and female find the right spot in the shallow stream, they are ready to lay the eggs. This is called spawning. The salmon's body has changed again; some of their bodies may be red and green instead of silver. It also has a large hooked nose.

Now that the salmon have spawned, and the eggs are safe under the gravel in a redd, the fish lose all of their energy. Pretty soon they will die; for their life cycle has been completed.

The salmon is a complete wonder. It faced many dangers and survived! It made a home in both the freshwater river and the saltwater ocean. It escaped wild animals and fishermen's nets. The most amazing thing was the way the salmon could find its home (after being gone for several years) just by sense of smell.

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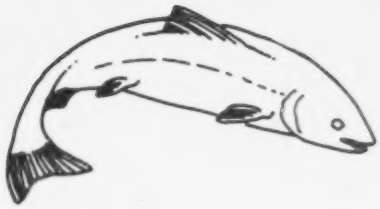

COMPLETE THE SALMON STORY

In your own words, complete this story on the lines below.

Imagine you are an adult Pacific Northwest salmon. You have lived for three years in the ocean and are now ready to return to your first home - your place of birth. Explain how you will get from the mouth of the river to your own stream. Imagine that you encounter some dangers on your way. Describe them in your story. Explain what you look like.

Teacher Information
Key

WORDS WE REMEMBER

Write the number of the word next to the correct meaning.

1.	Fry	6	Very tiny plants and animals that live in the sea.
2.	Alevin	1	Salmon young that have used up their yolk sac.
3.	Spawn	7	Any fish that is born in fresh water but lives most of its life in salt water.
4.	Redd	2	Newly hatched salmon with its yolk sac still attached to its body.
5.	Life cycle	3	To lay and fertilize eggs.
6.	Plankton	4	A round hole in a gravel bed where salmon eggs stay.
7.	Anadromous	5	A kind of circle of life. The chain of life from birth to death, to birth again.
8.	Smolt	8	A young salmon ready to go to sea.

NAME _____

WORDS WE REMEMBER

Write the number of the word next to the correct meaning.

1.	Fry	___	Very tiny plants and animals that live in the sea.
2.	Alevin	___	Salmon young that have used up their yolk sac.
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6.	Plankton	___	A round hole in a gravel bed where salmon eggs stay.
7.	Anadromous	___	A kind of circle of life. The chain of life from birth to death, to birth again.
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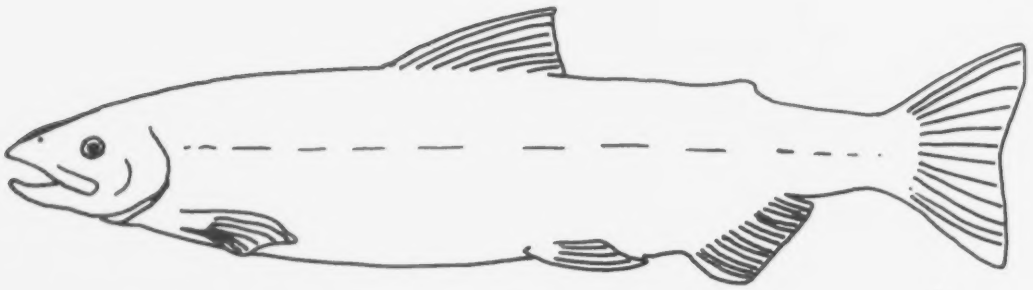
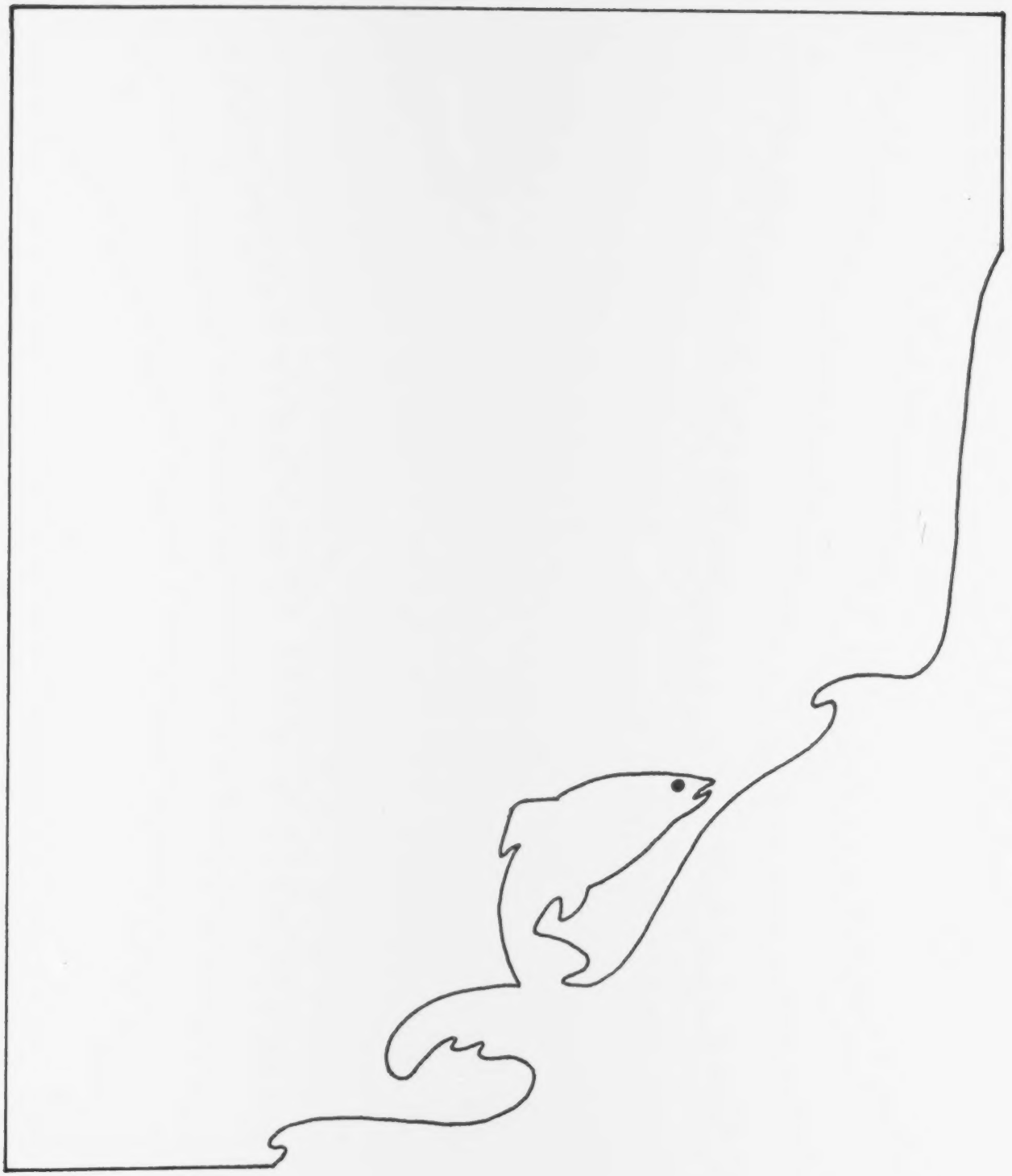




ACTIVITY 3:
HOW TO CREATE A SALMON HABITAT MURAL (2-3 DAYS)

ACTIVITY 3: HOW TO CREATE A SALMON HABITAT MURAL (2-3 DAYS)

CONCEPTS: The salmon's life is made up of distinct stages. At each stage of the salmon's life it faces new dangers.

OBJECTIVES: The student will be able to:

1. create a picture of one stage of the salmon cycle.
2. place the correct stage of the salmon at the correct location on the mural.
3. place the correct danger at the correct phase of the salmon's life.

TEACHER PREPARATION: The teacher will need to:

1. line a long bulletin board with white butcher paper or place it on a large floor area.
2. pencil in a cross-section of a landscape scene showing a mountain, stream, lake, river, ocean.
3. Copy the Teacher Information Sheet, "Salmon Stages" and cut the words into strips (one word per strip) for each student. (Make sure each stage is represented.)
4. Copy the Teacher Information Sheet, "Dangers to Salmon" and cut the words into strips as for "Salmon Stages."
5. Review Teacher Information on life cycle stages and dangers to salmon from Activity 2.

MATERIALS:

1. white butcher paper to cover large display area
2. colored felt pens and/or tempera paint
3. salmon stages cut into strips of paper (one word per strip)
4. 8"x12" white construction paper
5. dangers to salmon's life written on paper or tagboard slips

PROCEDURES:

1. Sketch a scene such as the one on the Teacher Information Sheet, "Salmon Scene " on a long length of white butcher paper that could be put on a bulletin board. (See diagram.) This may be copied by using an opaque projector; students may help!

2. Explain that this will be the background for their picture of salmon stages.

3. Have students divide into groups of 3 or 4 and ask each group to color one section of scenery.

4. Put slips of paper (with salmon names) in a container and allow each student to draw a name.

5. Explain that each student now has an assignment. As they re-read through the salmon story they must pay attention to what their salmon, at that stage of development, looks like.

6. After each student has read "The Incredible Life of the Salmon" he/she will illustrate a stage of the fish's life, then attach it to the landscape scene.

7. On the second day, discuss the dangers the salmon encounters in its life.

8. Repeat the above activity, this time just having students attach the danger word slips to the correct life cycle stage (See diagram, Teacher Information.)

9. (optional) Students may complete activity at desk using large (12"x18") white construction paper and drawing in the background drama.

EXTENDED ACTIVITIES:

1. Ask students to relate orally or in writing why the above dangers are a hazard to the salmon's life.

2. Students may wish to bring in gravel to attach to riverbed of "salmon scene".

3. Each student may wish to create his/her own scene on a 12" x 18" sheet of white construction paper. Ask each student to draw a landscape scene and color completely. List the stages of the salmon cycle on the board and ask the students to make small 1" x ½" labels and paste them to appropriate spaces on their landscape. They may then wish to make small cut-outs of several of the dangers to salmon and attach them to the correct location on their landscape.

Teacher Information

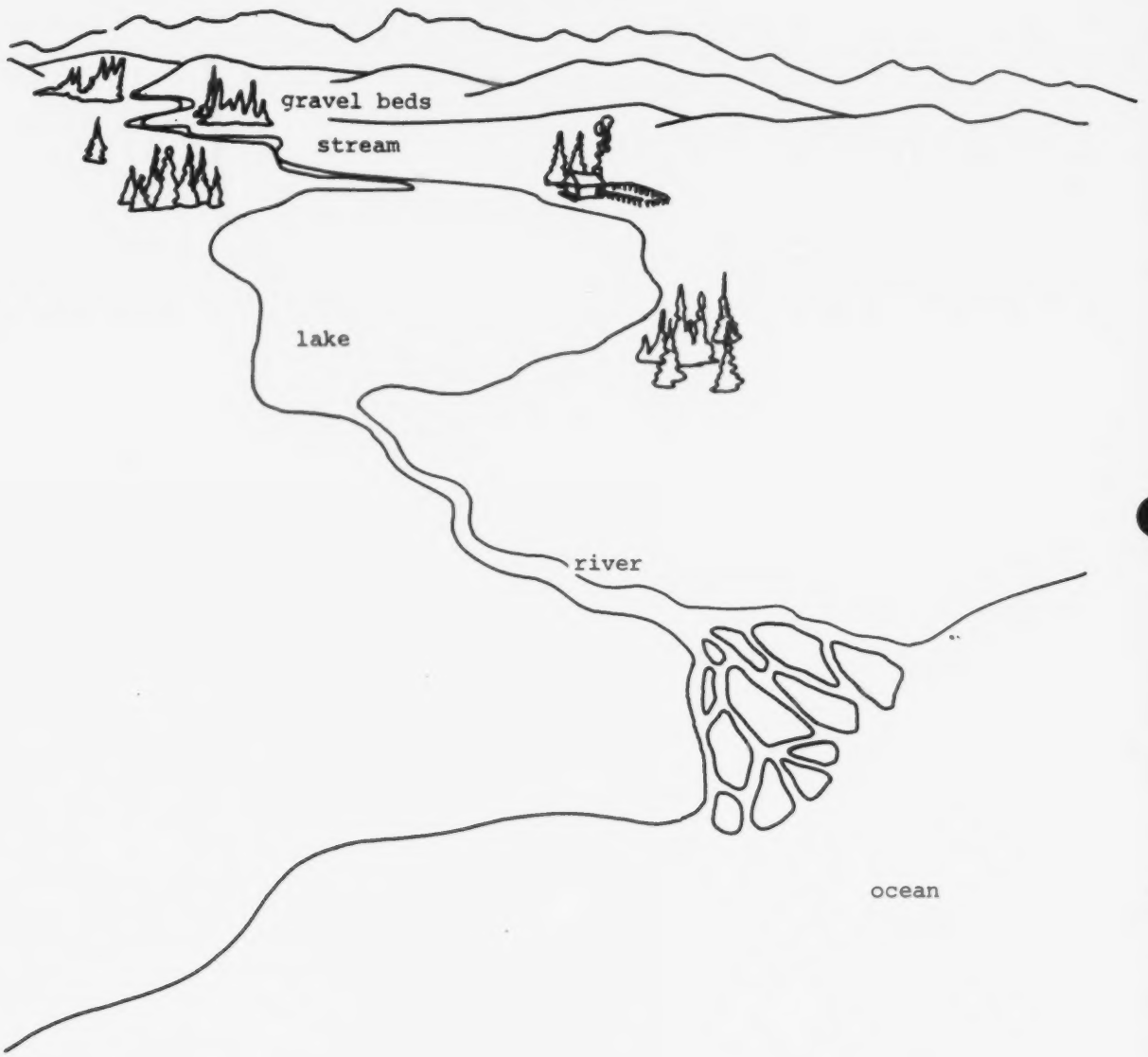
SALMON STAGES

ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON
ALEVIN	EGGS	FRY	SMOLT	FINGERLING	ADULT SALMON

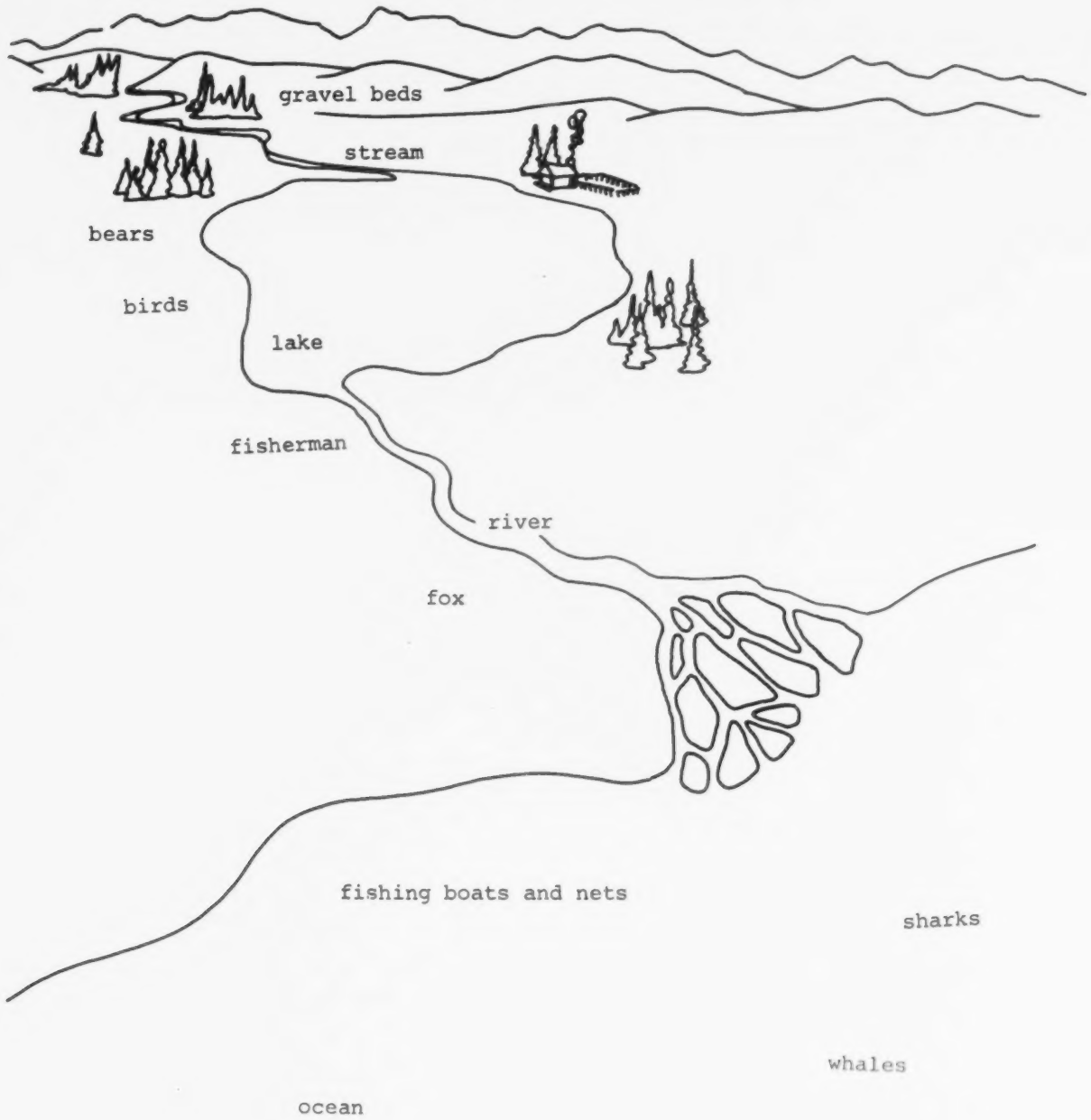
DANGERS TO SALMON

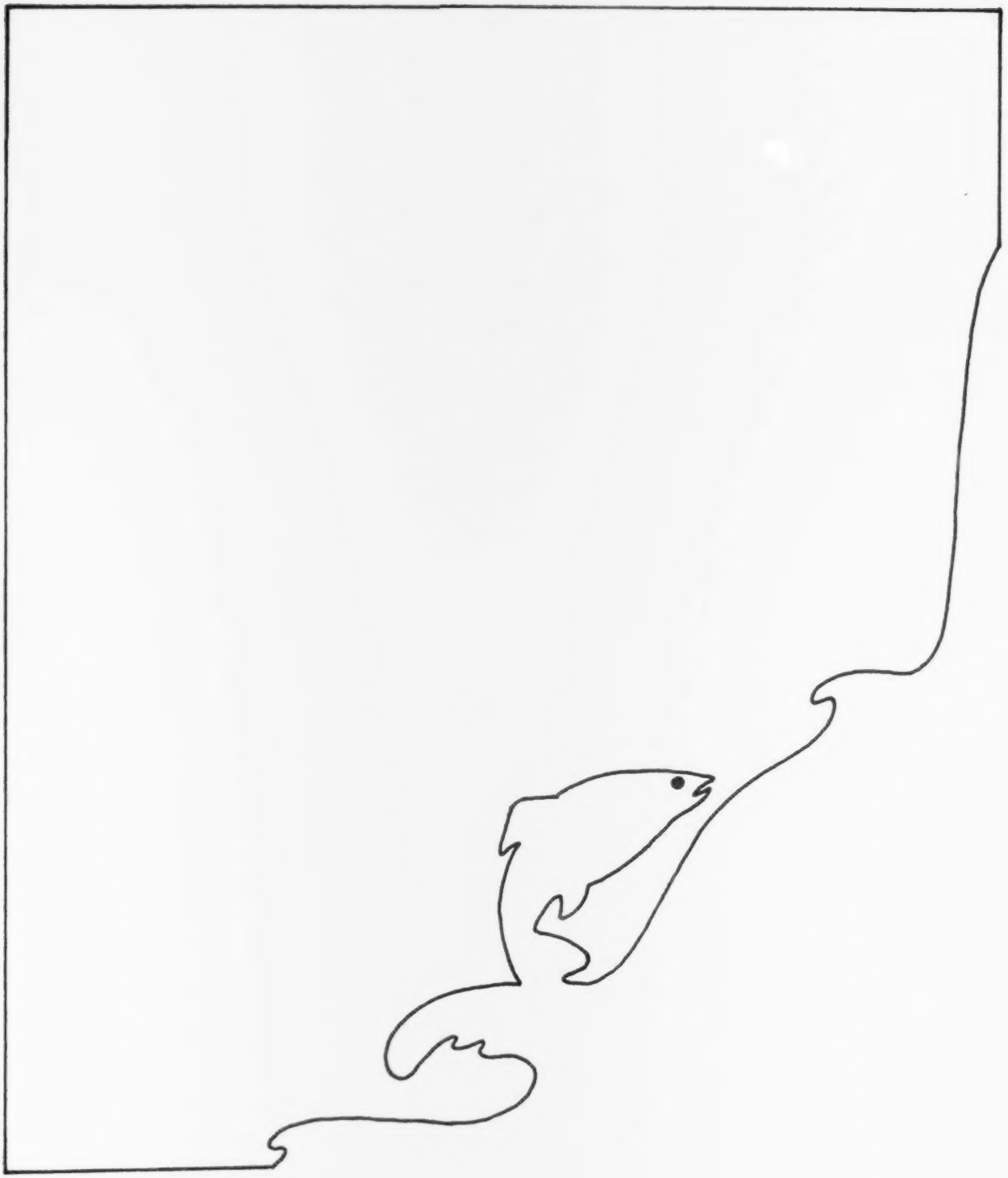
BEAR	FOX	BIRDS	SEALS	WHALES
SHARKS	FISHERMEN	FISHING BOATS WITH NETS	POLLUTION: EROSION	POLLUTION: CHEMICALS
BEAR	FOX	BIRDS	SEALS	WHALES
SHARKS	FISHERMEN	FISHING BOATS WITH NETS	POLLUTION: EROSION	POLLUTION: CHEMICALS
BEAR	FOX	BIRDS	SEALS	WHALES
SHARKS	FISHERMEN	FISHING BOATS WITH NETS	POLLUTION: EROSION	POLLUTION: CHEMICALS
BEAR	FOX	BIRDS	SEALS	WHALES
SHARKS	FISHERMEN	FISHING BOATS WITH NETS	POLLUTION: EROSION	POLLUTION: CHEMICALS
BEAR	FOX	BIRDS	SEALS	WHALES
SHARKS	FISHERMEN	FISHING BOATS WITH NETS	POLLUTION: EROSION	POLLUTION: CHEMICALS
FISHING BOATS WITH HOOKS	FISHING BOATS WITH HOOKS	FISHING BOATS WITH HOOKS	FISHING BOATS WITH HOOKS	FISHING BOATS WITH HOOKS

LANDSCAPE SCENE-BEFORE



AFTER MURAL IS COMPLETED, IT SHOULD LOOK LIKE THIS





ACTIVITY 4:
GETTING TO KNOW TYPES OF SALMON
(2-3 DAYS)

ACTIVITY 4: GETTING TO KNOW TYPES OF SALMON (2-3 DAYS)

CONCEPTS:

1. There are five types or species of salmon found in Pacific Northwest waters.
2. Each species of salmon has a different life cycle.
3. All species of salmon have similar migrating patterns.

OBJECTIVES: The student will be able to:

1. List five types of salmon.
2. Distinguish between two different life cycles of salmon.
3. Distinguish between two different species of salmon.
4. Distinguish two different names for one type of salmon.
5. Gain experience in chart reading.

TEACHER PREPARATION:

1. Read Teacher Information Sheet, "Salmon Species."
2. Suggested teacher reading: "Pacific Northwest Marine Fishes," Washington Department of Fisheries.
3. Become familiar with student material.

MATERIALS: Class set of:

1. salmon chart
2. Student Handout, "What Do You Think?"

PROCEDURES:

1. Ask students if they know any names of the different types or species of salmon (make a list on the board of their responses).
2. Distribute "Salmon Chart" to class.
3. Read through what each species looks like with class.
4. Distribute student handout, "What Do You Think?" and inform students that this is their worksheet to help them become familiar with the various species of salmon. They are to use the chart to locate information needed to fill in the blanks.
5. After students have completed the Handout, "What Do You Think?", go over it as a class.

EXTENDED ACTIVITIES:

1. Stuffed Salmon Art Project- using white butcher paper allow students to create their own 3 dimensional stuffed salmon.
   a. Distribute 2 pieces of 12" x 18" (or larger) butcher paper to each student.
   b. Ask students to draw a large salmon (they may choose the species) on both sheets and cut them out.
   c. Paper salmon will now need to be colored correctly (check chart for proper marking).
   e. Stuff salmon with crushed newspaper and finish stapling.
   f. The type of salmon can be written on a piece of paper and attached to fish.
   g. Fish may be suspended from ceiling with thread or string.

2. Salmon Species Fact Game
   a. Group class into two teams.
   b. Each student may use his/her chart for information.
   c. Write a salmon name on the board.
   d. Have one member from each team stand up.
   e. Ask a question about the species that is written on the board, such as: What is another name for this fish? How much does it weigh? When does it spawn? Does it have spots? Is its flesh dark red?
   f. The first team to answer the question gets the point.
   g. Students may take turns asking the questions.

Teacher Information

SALMON SPECIES

Points you may wish to discuss with students:

1. The five species of salmon have each adapted to different habitats.

2. Several species of salmon in Alaskan waters have adapted to long, cold, icy winters. The fish of California have adapted to a more moderate climate.

3. The stronger species (King and Sockeye) tend to swim further upstream to spawn; the weaker species spawn closer to the mouth of the river. The species that spawn further upstream have more body reserve to make the journey possible.

4. The stronger species (King/Chinook) will spawn in very coarse gravel and the weaker species (Pink) will spawn in fine, lightweight gravel. (This point could be related to the types of nests that birds build: a robin creates a large sturdy nest, while a hummingbird makes a small, lightweight home.)

5. Each species spends a different amount of time in the river, stream, lake or ocean.

6. The Sockeye or Red Salmon will live for one year in a lake before going to the ocean.

7. Each species has adapted to a different diet - thus affecting its size and strength.

NAME _____

SALMON CHART

What it looks like when it is an adult.	Sockeye (red)	King (chinook)	Silver (coho)	Pink (humpback)	Chum (dog)
Name of Salmon	Sockeye (red)	King (chinook)	Silver (coho)	Pink (humpback)	Chum (dog)
When does it spawn?	Summer	Fall	Fall	Summer	Fall
What does it look like	*blue tinged silver color *speckles on sides *turns bright red when spawning	*blue-green back *spots on both sides of tail and back	*bright silver *spots on top of body and top of tail fin *teeth are needle sharp	*heavily spotted back *hump behind the head	*fine dark speckles on back *no spots *dark side markings *large teeth at spawning
How much does it weigh?	5 to 7 lbs.	10 to 50 lbs.	6 to 16 lbs.	3 to 5 lbs.	8 to 18 lbs.
What color of "flesh" to look for at the grocery store	dark red	orangish-pink	dark pink	light pink to white	pink
How long it lives	3 to 7 years	5 to 7 years	2 to 4 years	2 years	3 to 5 years

Teacher Information - Key

WHAT DO YOU THINK?

1. What type of salmon can grow to be the largest or weigh the most?

   King/Chinook

2. Which salmon has dark red flesh? *Sockeye/Red*

3. The Pink and Sockeye salmon both spawn in the *summer* of the year.

4. A *Pink/Humpback* salmon weighs from three to five pounds.

5. Which two fish live to be the oldest?

   King/Chinook

   Sockeye/Red

6. The *Silver/Coho* salmon is always bright silver in color.

7. If you could catch one of these salmon, which one would you catch?

   (answers will vary)

   Why?

8. When does the Chum salmon spawn? *in the Fall*

9. Another name for the King salmon is *Chinook*.

10. Which fish has large dark spots on its back and tail?

    Pink/Humpback

11. Dog is another name for the Chum salmon.

12. When does the Silver salmon spawn? Fall

13. Another name for the Sockeye salmon is Red.

14. Which fish has the lightest colored flesh?
Pink/Humpback

15. The Pink/Humpback salmon has the shortest life.

NAME _____

WHAT DO YOU THINK?

1. What type of salmon can grow to be the largest or weigh the most?

   _____

2. Which salmon has dark red flesh? _____

3. The Pink and Sockeye salmon both spawn in the _____ of the year.

4. A _____ salmon weighs from three to five pounds.

5. Which two fish live to be the oldest?

   _____

   _____

6. The _____ salmon is always bright silver in color.

7. If you could catch one of these salmon, which one would you catch?

   _____

   Why?

8. When does the Chum salmon spawn? _____

9. Another name for the King salmon is _____.

10. Which fish has large dark spots on its back and tail?

    _____

11. _____ is another name for the Chum salmon.

12. When does the Silver salmon spawn? _____

13. Another name for the Sockeye salmon is_____.

14. Which fish has the lightest colored flesh?
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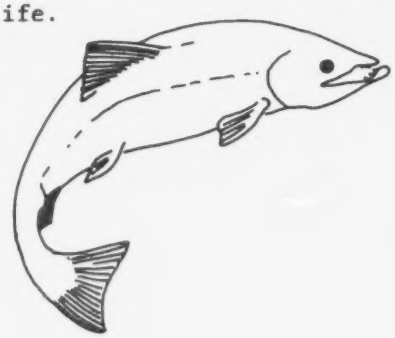
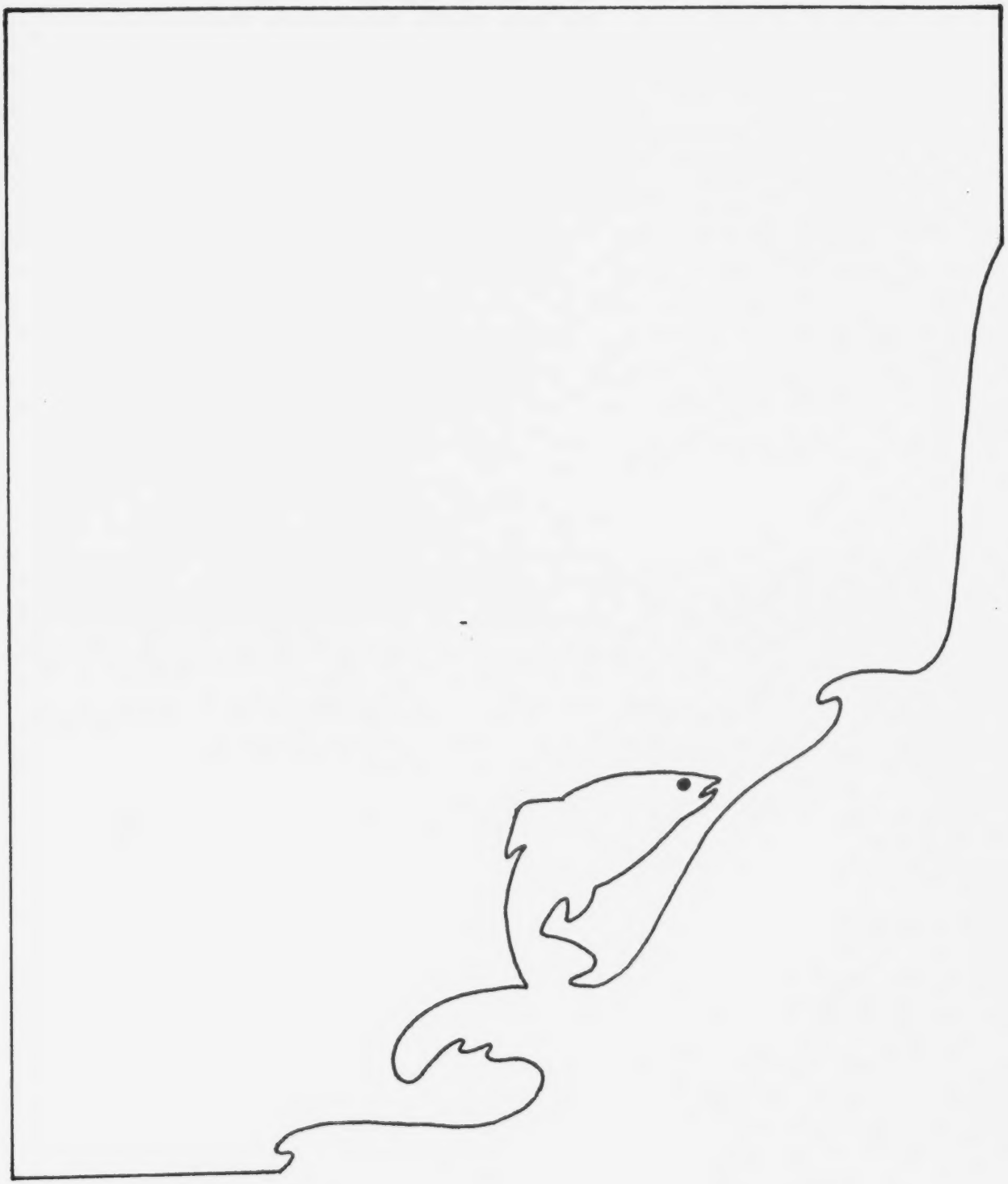
15. The _____ salmon has the shortest life.





ACTIVITY 5:
LIFE OF THE SALMON: SLIDE PRESENTATION AND NARRATION (1 DAY)

ACTIVITY 5: LIFE OF THE SALMON: SLIDE PRESENTATION AND NARRATION (1 DAY)

CONCEPTS: The salmon's life cycle is unique, continuous, and hazardous.

OBJECTIVES: The student will:
1. identify the basic stages of the salmon's life.
2. demonstrate ability to remember vocabulary words related to the salmon's life cycle.

TEACHER PREPARATION:
1. See materials listed below.
2. Become familiar with the slide narration.

MATERIALS:
1. slide projector and slide tray
2. screen
3. cassette recorder (if you have taped the narration)
4. class set of Student Handout,"Salmon Life Cycle."

PROCEDURES:

1. Review with students these terms:
   redd: nest of salmon eggs
   alevin: newly hatched baby salmon
   fry: first stage of salmon where it feeds itself. It is ½ to 2 inches long.
   Smolt or Fingerling: a young salmon ready to go to sea.

2. Explain to students that they will need to watch for the stages of the salmon's life and the dangers the salmon will encounter.

3. Show slides to students - encourage discussion as you go by, asking:
   a. Do you remember this term?
   b. What is the salmon doing now?
   c. What stage comes next?
   d. How is the salmon finding its way home?

4. Distribute Student Handout, "Salmon Life Cycle." Direct students to complete the worksheet.

Photo Credits

Slides were made available by:

King County Planning Divison, Seattle, Washington: Bill Eckel, Ray Heller and Pat Higgins

Fisheries Research Institute: Steve Wilson

Orca Survey: Ken Balcomb

Jones and Jones: Ken Caldwell

Peninsula College, Port Angeles: Paul E. Richmond

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 1	A salmon's life is an incredible one! Salmon spend most of their lives on a journey that is full of danger. This slide presentation will take you on a journey with some salmon. You will see the salmon as tiny eggs; and what their lives are like in the freshwater stream and in the salt water ocean. Have you ever seen a salmon? Did it look like this?
Pic. No. 2	This map of the Puget Sound area shows us many streams and rivers where salmon have spawned. All of the dark brown lines show the path that salmon take when they return to their birth-place.
Pic. No. 3	This is the home for salmon during most of their lives. We must be very careful to take care of the water so that it will always be clean. Puget Sound is the home for many salmon.
Pic. No. 4	A freshwater area up in the foothills of a mountain is where the salmon begins and ends its life.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 5	A shallow stream such as this is where you might find salmon eggs buried under 6 to 8 inches of gravel at the bottom of the stream.
Pic. No. 6	Many months before, a female salmon built a redd here and laid her eggs. How does a fish build a nest? Let's watch!
Pic. No. 7	The female salmon hunts around until she finds the right type of gravel; not too large and not too deep. This is called "nosing." Here she is "nosing" the gravel to find the best place for her nest.
Pic. No. 8	Now the female turns on her side (or upside down) and digs her nest by moving her tail up and down.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	Narration or Audio Direction
Pic. No. 9	As she flips her tail, small bits of dirt and gravel are scattered into the water and carried downstream a short distance by the current.
Pic. No. 10	The female is now ready to lay her eggs in the small hole. A male salmon is by her side to fertilize the eggs.
Pic. No. 11	The female salmon then covers the fertilized eggs with gravel from in front of the nest. Again she uses her tail to move the pebbles.
Pic. No. 12	She is now ready to move on and build another nest. Female salmon dig several nests and lay their eggs in several places. All of these nests combine to make a redd. Salmon usually spawn at night.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 13	Salmon eggs stay in the nest for two to six months. This is what a large group of eggs looks like. The small dark spots are the salmon's eyes.
Pic. No. 14	Often times the eggs are not completely covered by gravel, then they wash downstream and might be eaten by a bird. Many of these eggs will never grow to be large fish. What else could happen to the salmon eggs?
Pic. No. 15	Only 10 out of 100 salmon eggs will get to the fry stage. If the eggs are completely covered by a fine dirt, as in this picture, oxygen is cut off from the embryo and it will die.
Pic. No. 16	The heat and cold can affect whether or not the egg will survive. Ice can cut off the oxygen supply that is needed for life, or freeze the egg.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 17	These eggs are continuing to grow. They have turned a soft yellow in color.
Pic. No. 18	Soon the eggs will hatch into little alevins.
Pic. No. 19	Here is an enlarged photograph of an egg that is ready to hatch. The dark spot is the salmon's eye.
Pic. No. 20	Can you see the fishes' eyes in this photo-graph?

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 21	Many changes have taken place inside the egg. It is now ready to leave the small rounded shell of the egg.
Pic. No. 22	As the alevin hatches, its yolk sac is attached underneath its body. The alevin will remain under the gravel for many weeks until its "food sac" is used up. Then nature tells it it is time to find its own food.
Pic. No. 23	The small fish is now at the fry stage.
Pic. No. 24	Free swimming, it must now find its own food. Luckily its water environment is filled with small plant particles and tiny bugs. Can you see some of the fry's food in the water?

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 25	The fry is now starting to resemble a large fish. (Notice its tail and fins.) Its body is not silver yet. It has dark markings on its sides to help camouflage it.
Pic. No. 26	Here we can see how the baby salmon's markings help it to hide. The fish needs to look like part of its surroundings.
Pic. No. 27	The salmon fry will stay in the stream for several months as their bodies continue to grow. Sometimes these beautiful rivers become polluted by man.
Pic. No. 28	If the water temperature becomes too hot, the young salmon will die. Some pollution heats the water to 85°. This is 7° warmer than any salmon can survive. Most salmon prefer water temperature that is below 65° F.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 29	We must all help care for streams and rivers so that this will not happen. How could you help keep water clean?
Pic. No. 30	Another danger to the young salmon is wild animals. Here a blue heron waits for its dinner to come swimming by.
Pic. No. 31	The salmon is growing larger and is now making its way to the sea. During its journey, it may pass through a lake such as this. This lake is covered with plant life. These plants cut down on the oxygen supply for fish.
Pic. No. 32	Coming down from the river a fingerling may come across a man-made dam. Now what will it do? These dams have small openings where young fish can pass through and continue on their journey.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 33	At last the fingerling or smolt has reached the sea! It will remember where that stream or river is located for the rest of its life.
Pic. No. 34	For the next few years the salmon will swim in the Pacific Ocean. What dangers will it face now? Let's look and find out.
Pic. No. 35	Humans like to catch salmon.
Pic. No. 36	Whales eat salmon.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 37	Killer whales especially enjoy feeding on salmon swimming in the ocean.
Pic. No. 38	Harbor seals wait patiently until a school of salmon swim by. They then slip into the water and have a tasty meal.
Pic. No. 39	Large fishing boats with nets can scoop up many salmon at a time. We can see fishing boats like this in Puget Sound. The salmon has a challenging life as it lives in the sea. Which of these dangers would be the hardest to escape?
Pic. No. 40	When the signal comes, instinct tells the salmon it is time to find its way back to its home or place of birth.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	Narration or Audio Direction
Pic. No. 41	Salmon that have lived in the Pacific Northwest might find their way to Lake Washington. Before they enter the lake they must pass through the fish ladder.
Pic. No. 42	The fish ladder was built many years ago to help salmon travel from Puget Sound to fresh water. It is special to be able to see the fish as they swim up each step of the ladder.
Pic. No. 43	Salmon have no idea what awaits them upstream. They don't think about what they are going to do. Here we see many fish swimming upstream against the flow of water.
Pic. No. 44	These fish have lost their silver color. Their backs are red and their heads and tails are green. Some of them are developing hook noses.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 45	Swimming against the current, some salmon have been known to jump 11 feet out of the water to get over a waterfall or dam.
Pic. No. 46	These fish are looking for the best place in the river to build nests and lay their eggs. They are ready to spawn.
Pic. No. 47	The salmon's body has certainly gone through many changes in its life. Here you can see another color change. Also the hook nose is common for the male salmon.
Pic. No. 48	After spawning is completed the salmon lose all of their energy and will quickly die. Often times animals will feed on their bodies.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 49	The life cycle has been completed. The salmon's journey was not an easy one! In each stage of its life it faced many dangers. Truly, this story is one of nature's wonders.
Pic. No. 50	One of the dangers the salmon faced in its life was pollution. Let's take a closer look at rivers and streams in the Puget Sound area and the problem of pollution. People of all ages enjoy streams and rivers, whether in their backyard or at a state park.
Pic. No. 51	It is fun to run and play beside a beautiful brook or to camp along the side of a gurgling river.
Pic. No. 52	Nature provides us with many pretty settings such as this one. In this picture we can see forests, trees, bushes and grass; all of these things provide a natural ground cover and help protect soil from being washed away.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 53	When housing developments are built, the land must be cleared away and asphalt and cement will become the new ground cover. Can pavement and cement absorb rain water? What will happen to all of this water?
Pic. No. 54	Water that cannot be absorbed into the ground because of cement or blacktop will flow into ditches, gullies, ravines, streams and rivers very quickly. Because of the large amounts of water, the river banks are cut away and the soil and gravel are carried downstream. When the rain water stops flowing, the river bed will look like this. Fish eggs and small fish can be killed by all of the soil in the water.
Pic. No. 55	This small forest stream would be a perfect home for little fish. Do you know why? The stream is surrounded by trees and bushes. These plants will provide shade for the water and keep it very cool, and also bugs and flies can live in the branches. Little fish need to have cool water and small bugs and insects.
Pic. No. 56	Would this be a good home for fish? Are there any bushes where insects could live? Are there any trees for shade to keep the water cool?

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 57	This stream would not be a good home for small animals either. If there were a sudden rain-storm, what would happen to the sides of the bank? What happens when there is too much soil in the water?
Pic. No. 58	Another thing people do to rivers, streams, gullies, and ravines is to throw litter into them as if they were a garbage dump. This is not the place where garbage belongs.
Pic. No. 59	People also use storm drains that are located in streets to dump left-over car oil or other chemical waste. These drains go directly into rivers and streams. This is another way that people pollute the water. Storm drains are not for garbage!
Pic. No. 60	These fish could not live in water that is filled with litter, oil, and soil from storm water run-off.

Slide Presentation

Title: The Incredible Life of the Salmon	Page No.____
Picture Description	**Narration or Audio Direction**
Pic. No. 61	What are some things that we can do <u>now</u> to help make water clean for fish and other small animals? Is clean water something only adults can take care of? Maybe your class can become involved in a clean water project.
Pic. No. 62	By taking a field trip to a stream or river that is close by you can help pick-up litter that has been left behind.
Pic. No. 63	You also need to remember that whenever you are near a brook or stream, you must not leave any waste or litter about. It is your job every day to make sure you help keep water clean by <u>not</u> <u>littering</u>.
Pic. No. 64	Your parents can help too! Adults need to know how important clean water is to all of us. People want to have places where they can enjoy beautiful rivers and streams with fish and other wildlife. Salmon need clean water to live and there are fewer and fewer salmon returning to rivers each year. These are some of the reasons people need to think of ways to keep water clean.

SALMON LIFE CYCLE

1. Salmon lay their eggs in a freshwater *stream or river.*

2. The little nest where the eggs stay in the gravel is called a *redd.*.

3. List the four stages of a salmon's life.

   eggs *fry*

   alevin *smolt or fingerling*

4. Can you draw a picture of an alevin?

5. When a salmon is a smolt, what color its its body? *silver*

6. ___True _X_ False A salmon can live in a polluted river.

7. List five animals that like to eat salmon.

   whales *birds* *seals*

   sharks *foxes* *bears*

8. _X_ True ___False There are different types or species of salmon.

9. What do salmon fry eat? *small bugs, water plants, insects*

10. Can you draw a picture of an adult salmon?

Teacher Information - Key

11. The salmon live in the Pacific ocean.

12. What danger does the salmon face in the ocean? fishing boats and fish nets. also whales and seals.

13. The salmon finds its home again by instinct and/or sense of smell.

14. When the salmon lay their eggs in the bottom of a stream, we say they are spawning.

15. Draw a picture of a salmon when it is ready to spawn.

16. List 5 ways people destroy the home of salmon

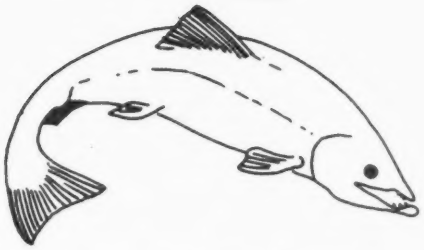
littering rivers
chemicals and sewage
building housing developments
storm water run off
large parking lots

17. How can you help keep water clean?

(answers will vary)

18. What are 3 things adults can do to keep water safe for fish?

NAME _____



SALMON LIFE CYCLE

1. Salmon lay their eggs in a freshwater _____
2. The little nest where the eggs stay in the gravel is called a _____.
3. List the four stages of a salmon's life.

_____ _____

_____ _____

4. Can you draw a picture of an alevin?

5. When a salmon is a smolt, what color is its body? _____
6. ___True ___False A salmon can live in a polluted river.
7. List five animals that like to eat salmon.

_____ _____ _____

_____ _____ _____

8. ___ True ___False There are different types or species of salmon.
9. What do salmon fry eat? _____
10. Can you draw a picture of an adult salmon?

NAME _____

11. The salmon live in the _____ ocean.

12. What danger does the salmon face in the ocean? _____

_____

13. The salmon finds its home again by _____.

14. When the salmon lay their eggs in the bottom of a stream, we say they are _____.

15. Draw a picture of a salmon when it is ready to spawn.

16. List 5 ways people destroy the home of salmon

_____ _____

_____ _____

_____

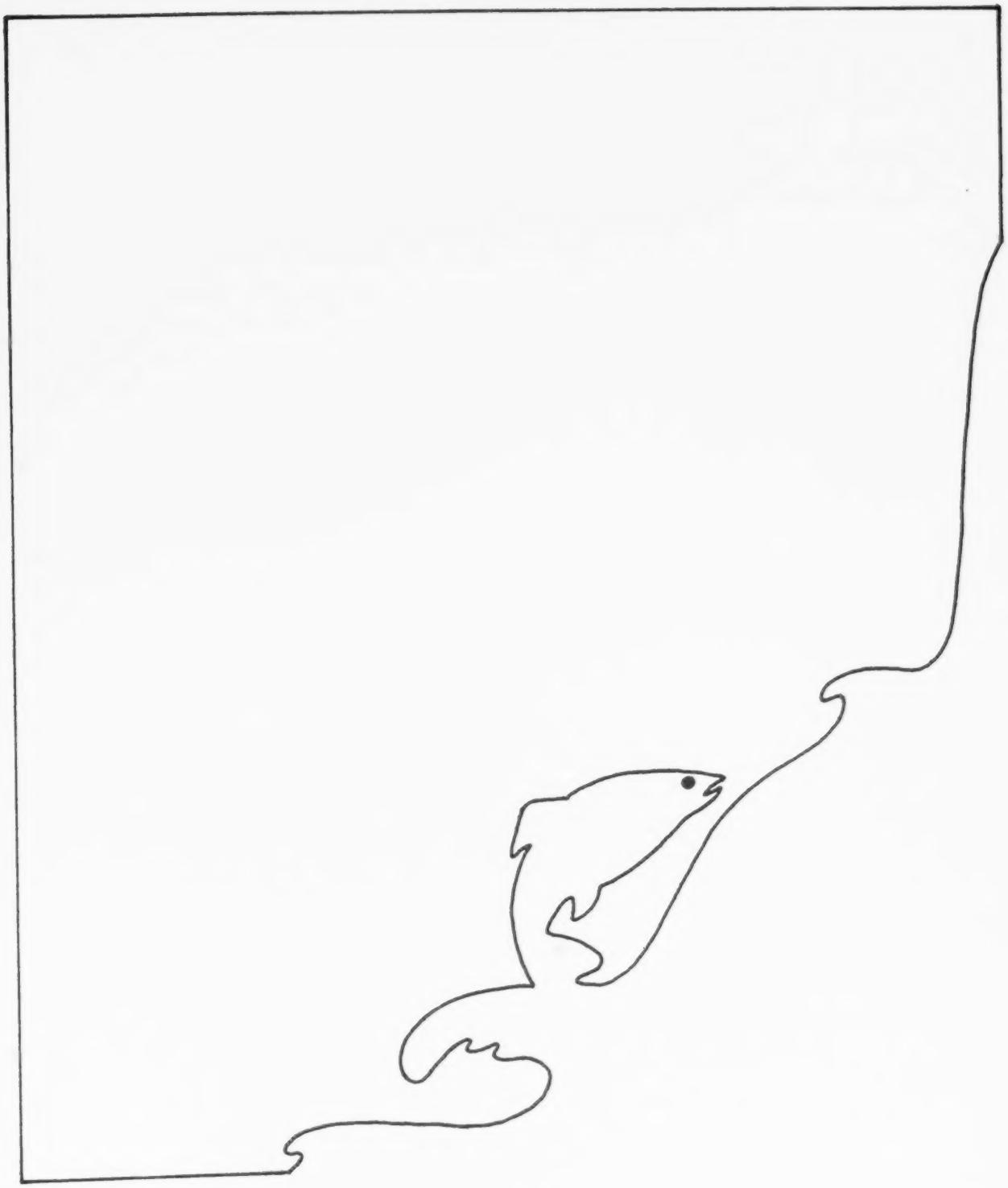
17. How can you help keep water clean?

_____ _____ _____ _____

18. What are 3 things adults can do to keep water safe for fish?

_____ _____

_____



ACTIVITY 6:
SALMON JOURNEY
(1-2 DAYS)

ACTIVITY 6: SALMON JOURNEY (1-2 DAYS)

CONCEPTS:

1. A pair of salmon produce many offspring.
2. Salmon face many life-threatening hazards as they travel upstream to spawn.
3. Each hazard to a stream (erosion, garbage, culverts, toxic wastes, etc.) will decrease the number of salmon that return to their place of birth to spawn.

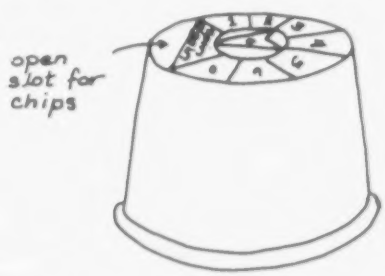
OBJECTIVES:

Students will demonstrate ability to:

1. identify at least one type of salmon by the end of game.
2. follow directions in order to construct and physically take part in an obstacle course (other students of the same school should be able to experience also).
3. relate five hazards a salmon faces on a journey upstream to spawn.
4. determine the number of salmon that will return to spawn at the same location in a riverbed by using math skills (multiplication).
5. list two ways that clean water is essential to our ecosystem if salmon are to survive.

TEACHER PREPARATION:

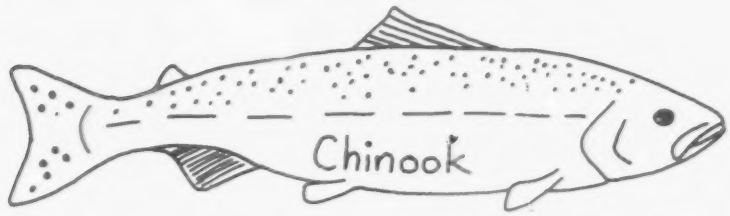
1. select and reserve for one to two days a large area within your school to set up the game (gym, part of lunchroom, covered play area, vacant classroom, part of hallway, etc.)
2. collect "junk" (See Materials) for each station of the obstacle course from home, students, neighbors, etc.
3. prepare six large containers (coffee cans, shoe boxes, ice cream containers, etc.) as station spinners and chip collection containers. Mark 0-6 on each spinner dial.



4. Make at least 100 chips marked male or female. See Materials.
5. Make wall display with game directions for students.

NOTE: The Salmon Journey Game is available as a kit from the Pacific Science Center. The kit contains the materials needed to set up and conduct the game. Please call to reserve the kit.

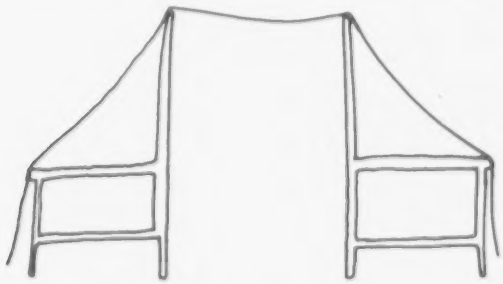
6. Make cardboard salmon cutouts, one for each species, label with species name. Example:



7. Use mural or bulletin board display made in Activity 3, "How to Create a Salmon Habitat Mural" for Station 7.

MATERIALS: There will be 7 stations consisting of the following materials: (any of the stations could be simulated by having students draw pictures or murals to show the contents of the station, i.e. see how creatively students could create a "junk" scene on paper.)

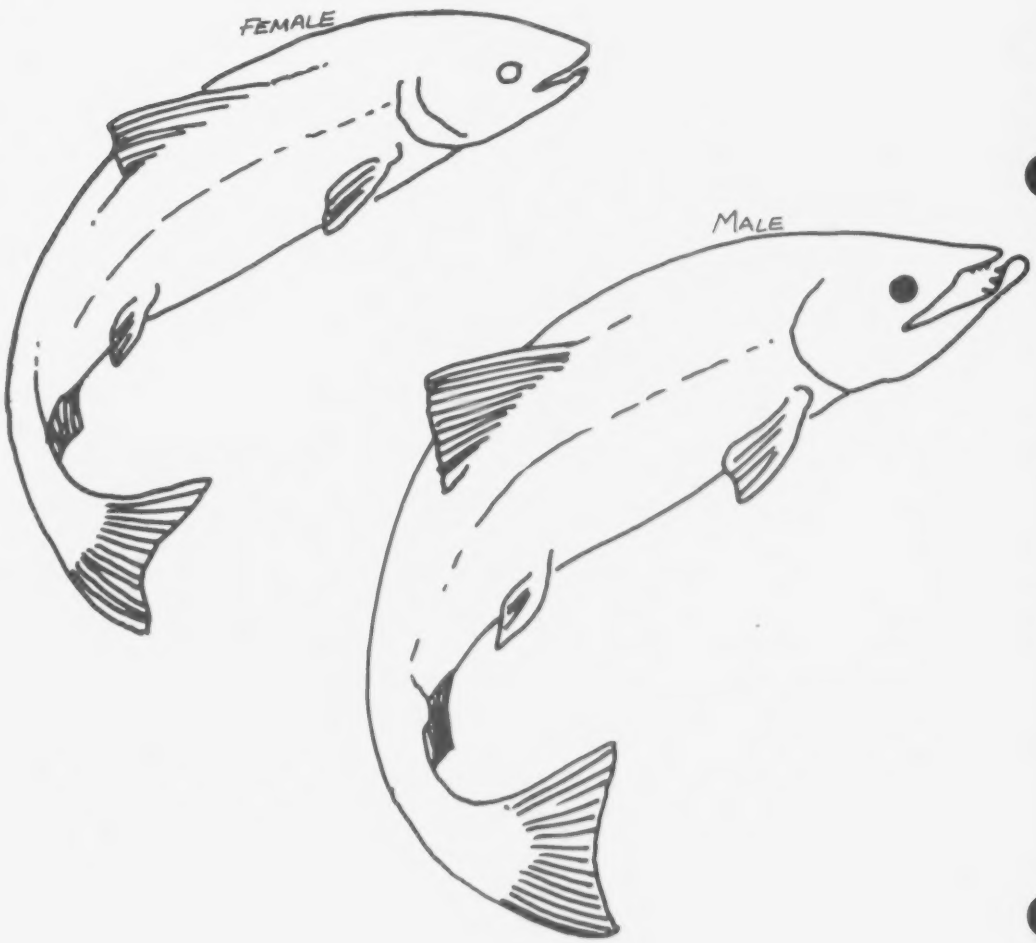
1. Erosion - small piles of dirt or torn brown crepe paper to resemble dirt. Four large mason (mayonnaise) jars filled ¼ full with dirt and 3/4 full with water. Students would shake these to see how cloudy water can become with erosion - and that it does not filter down quickly.
2. Humans - fish net, large hooks on string.
3. Heat - old heat lamps to create a warm spot.
4. Junk - plumbing fixtures, bottles, containers, old tires, etc.
5. Culverts - as cement culverts are hard to obtain, you may wish to use chairs and blankets to simulate a culvert.



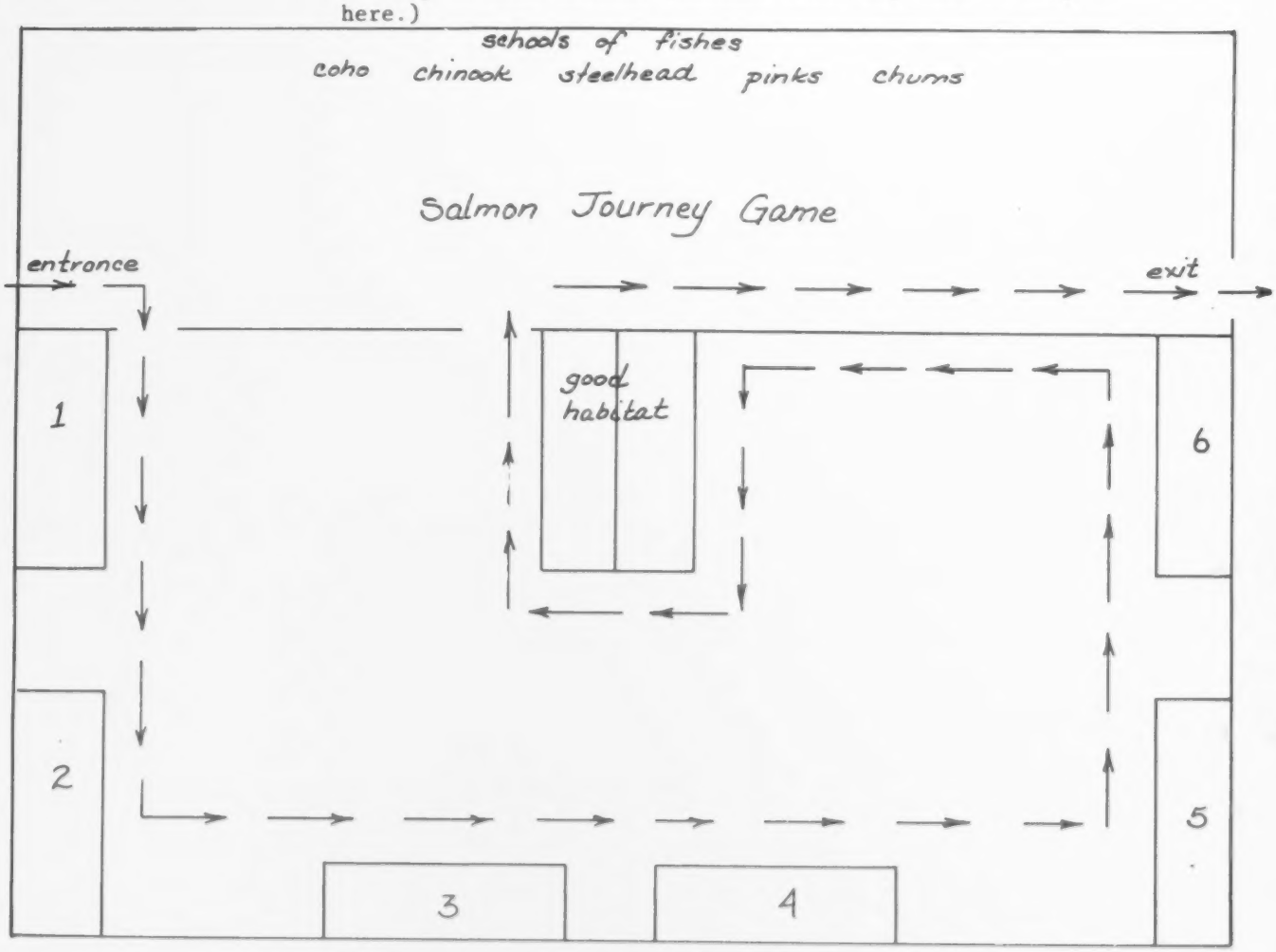
6. Toxic Waters - hang empty bottles and cans of materials often disposed of in stream drainage system, oil, pesticides, paint, anti-freeze, etc.
7. Good Salmon Habitat - use poster or mural made in Activity 3 here. You may also have overhanging boughs here as well.

8. 5 display cards, 5"x7", with the numbers 30, 60, 90, 120, 150, and 2 holes on top of each.

9. 20 salmon chips for each team; 10 male and 10 female. You could have 5 teams (1 team per species) going through the obstacle course at one time.
10. 5 salmon cut-outs with labels of cardboard - painted to illustrate each of the 5 species (Chum, Pink, Coho, Chinook and Sockeye). See poster, "Anadromous Fish of the Pacific Northwest."
11. a long strip of blue crepe paper or fabric to simulate a stream.
12. nails or tacks to place display cards on board.
13. 6 station spinners
14. You may wish to copy this diagram to reproduce and use as salmon chips in the game.



PROCEDURES: 1. Set up 6 hazard stations and wall display in large space, according to this diagram. Select at least 2 older students to help at each station (another class may want to help here.)



2. Place one spinner and collection container at each station.

3. Follow the game rules and procedures.

4. Post game rules on display board at beginning of game. Student helpers will also review rules with students as they continue through the game.

5. Stations may be used by students throughout the school. As one class goes through, they may wish to see how many returning adults their class received.

6. If classes are given general outline and object of "Salmon Journey Game" before they begin, it will be a better learning experience.

GAME RULES

Object of the Game

To make a journey upriver to spawn and to end the journey with as many pairs of male and female salmon as possible.

1. Students may travel through the obstacle course in a team of 2 to 4 students.

2. Each team is given:
   a. 20 salmon chips (10 male and 10 female)
   b. 1 salmon label

3. Each team is given mentioned game parts (see above) and travels to station 1.

4. One member spins the dial on the spinner. The total number shown represents how many salmon were lost to that particular hazard. For example, if the number is 5, then 5 salmon chips must be discarded into the chip container. Teams should take care to keep the number of males and females as close as possible when they discard.

5. The team then travels to the next station and repeats the spinning of the dial and discarding of salmon chips through all seven stations.

6. If the team runs out of chips, they are out of the game and should return to their starting point.

7. When the team reaches "Good Salmon Habitat" station, the total number of pairs are counted by station helpers.

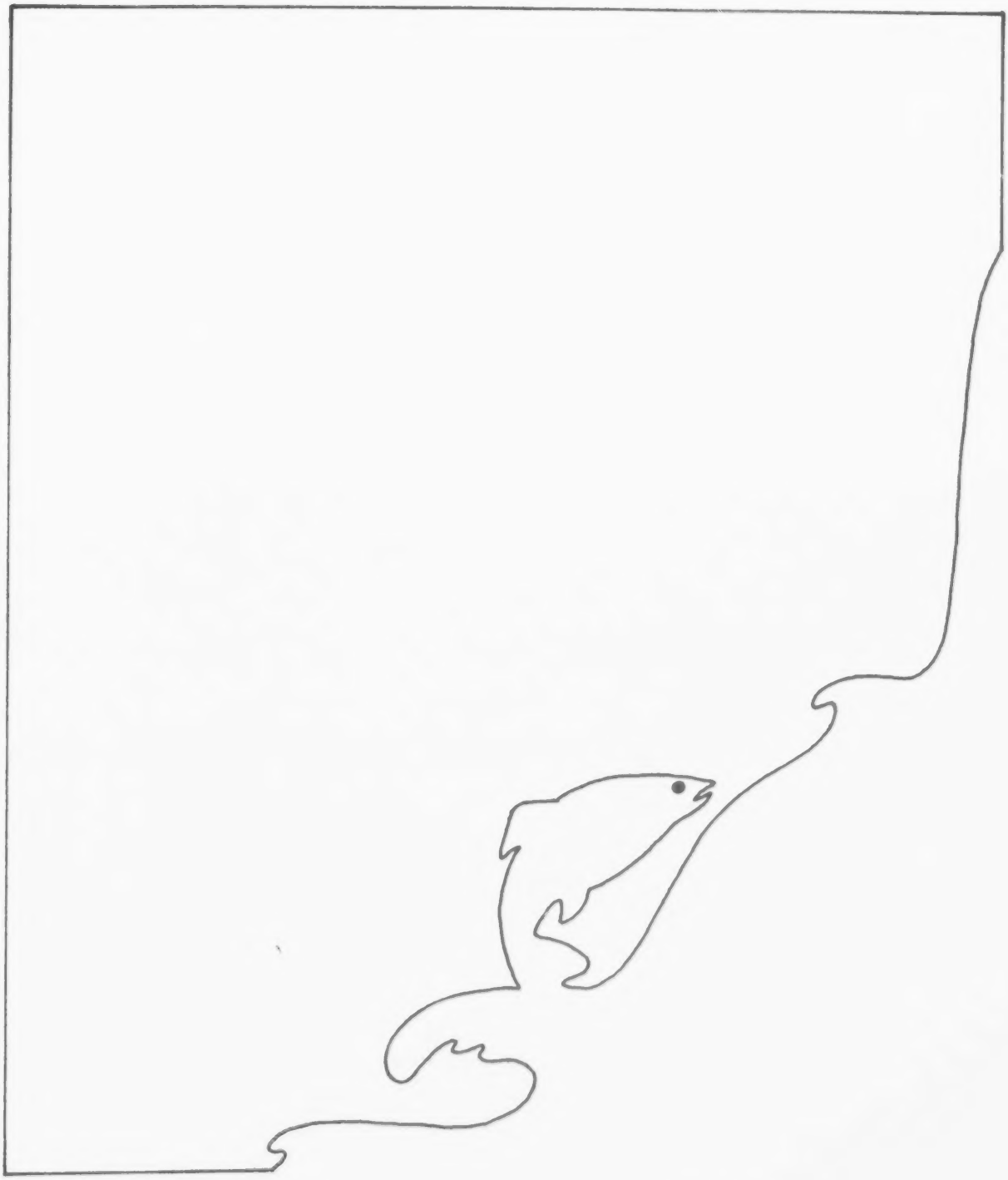
   The teams are then told how many salmon will live to be offspring from that pair(s). Two salmon make about 3,000 fertilized eggs. Assuming a 1% survival rate:

   $$\begin{array}{r} 3{,}000 \text{ eggs} \\ \times\ .01 \\ \hline 30 \end{array}$$

   So, 30 salmon would be likely to return to spawn.

8. The team members (or helpers) then add their total number of offspring (use display cards) to the display board next to the correct species their team represented. The display board will be on the back wall of the game area.

This game was developed by the Pacific Science Center, Metro, City of Bellevue, King County Planning Commission, Washington State Fisheries, and the City of Seattle for the Pacific Science Center's "Science Circus, 1979."



ACTIVITY 7:
STREAMLINED ANIMAL
(3 DAYS)

ACTIVITY 7: STREAMLINED ANIMAL (3 DAYS)

CONCEPTS:

1. A salmon's body is adapted to its water environment at all stages of its life.
2. Each part of the fish's body has an important function; i.e., gills for breathing, fins for movement, scales for protection, location of eyes for increased vision, etc.

OBJECTIVES: Students will demonstrate ability to:

1. describe how a fish is suited to living in water by observing and recording how it moves.
2. describe what salmon's scales are like.
3. describe the salmon's field of vision.
4. describe the movement of salmon and the function of gills by observing and participating in experiments.
5. label seven basic parts of a salmon.

TEACHER PREPARATION:

1. Read through Student Handouts.
2. Decide if you would like to use the activities in "Try This" section as stations. If they are to be used as stations, you will need to duplicate questions to be posted at each station, along with appropriate equipment.
3. If students are to participate in lab experiments as a total group, arrange equipment accordingly.
4. Obtain a fish skin (large bottom fish would be best for this, i.e., cod, red snapper, flounder, etc.) and fish head from the fishmarket. You want them to be as fresh as possible.
5. Obtain goldfish (student may bring them from home) and magnifying glass(es) for lab experiments.
6. Read through discussion questions and answers before lesson is taught.
7. Duplicate student handouts or make overhead transparencies of information.

MATERIALS:

1. 1 class set of hand lenses, magnifying glasses or microscope
2. 1 cup of vinegar
3. 1 class set of student worksheet, "A Streamlined Animal."
4. fresh fish skin and head (for gills) and fins.
5. several large, wide-mouthed aquaria jars
6. class set of discussion questions, "A Streamlined Animal."
7. 2-6 goldfish

PROCEDURES:

1. Hand out student worksheet. Decide how much material you wish to cover in one day and allow for those experiments, discussions, etc.

2. If stations are to be used after student reading, discuss procedure with students. You may wish to ask students to rotate through stations or do experiments as a large group.

3. After students read material use the following questions for each topic:

Fins for Swimming, Speed, and Control

1. When the chest fins are spread out from the body, would a fish move faster or slower? (Slower - when in this position they act as a brake.)
2. Which is the largest fin? (Tail fin, it moves the fish through the water.)
3. Have you seen a fish out of water? Does it go anywhere?
4. What do the other fins do?
5. Have a picture of a streamlined airplane handy. Compare the job of a tail fin and tailsection of a plane. Compare the streamlined bodies of both. The wings of a plane are similar to which fins?

Muscles for Strength

1. Why does the salmon need so many muscles? (Each muscle pulls only on the part it is attached to - by getting shorter. For every movement, many muscles are needed.)
2. Can you find a zig-zag pattern in the fish's muscles? Trace it with your finger.
3. Almost the entire body of the salmon is made up of muscle. When you eat salmon, you eat mostly muscle.

Scales for Protection

1. Slime is produced by invisible glands scattered all over the body. This slime helps keep off fungi and bacteria and also oils the body surface.
2. In size and thickness, scales may vary greatly; on some fish they are microscopic.
3. Students may do some research to find which fish has the largest scales in the world.

Gills for Breathing

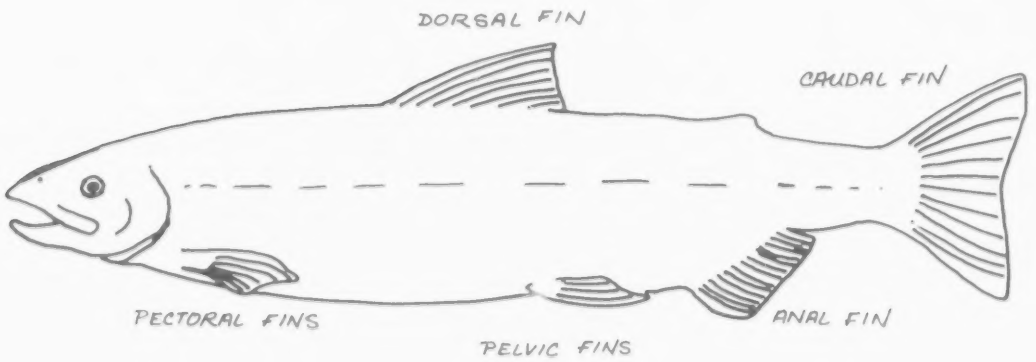
1. Gills work like lungs.
2. Does the fish use its nostrils for breathing? (No, just smell.)
3. Look at the gills in vinegar. Why are the gills red? (Their thin covering inside permits the blood inside to show through.)
4. Explain to students that the oxygen used by fish is not bound up chemically in the water molecules (H_2O), but is oxygen gas that is dissolved in the water.
5. Which water has more oxygen in it, the mountain stream of young salmon or a pond of water? Why? (Mountain stream - the constant turbulance adds oxygen.)
6. Display a glass of boiled water. Stir it briskly. How have I made this water better for fish? (Stirring the water mixes in some air, and therefore oxygen gas, into it.)

A STREAMLINED ANIMAL

Earlier in this unit you may have listened to a story of a salmon as it barely escaped death. The salmon was a good swimmer and used many quick movements as it glided through the water. Its eyesight helped it to be aware. Whether the salmon is in the stream or in the ocean, there are certain parts of its body that are of special help. The salmon uses special muscles to dart quickly about in the water. It also has a special covering of scales that make it almost waterproof. Behind the salmon's head are gills that make it possible to breathe underwater. Let's take a closer look at these parts of the fish and some others to see how this streamlined animal survives in the ocean.

What does streamlined mean? We say a fish is streamlined if it is sharply pointed at the head for parting of the waters, and the larger part of the body tapers back toward the tail so that the water can flow smoothly along the sides. A salmon is indeed built this way.

Fins for Swimming, Speed, and Control
A salmon has seven fins that all work together. There are two pectoral fins and two pelvic fins, one on each side of the body. There is one anal, one caudal and one dorsal fin.



As a salmon moves through the water its movements are similar to an airplane. The caudal fin, or tail fin, is like an airplane's tail-piece and will send the body to the right or left. The fish guides its course through the water with the caudal fin. The powerful tail also acts as a propellor. Pairs of fins on either side of the pectoral and pelvic fins are like an airplane's elevator, helping the fish to move up and down in the water. These fins also act as brake; salmon will use these to slow down, change speed, or stop.

The back fin or dorsal fin and the anal fin help to balance the fish in the water. These two fins keep the salmon from rolling over and over as it moves.

TRY THIS:
Look at a fish swimming about in water. By looking at the fish you will be able to see how the fins help the fish swim.

1. Watch the caudal fin. In what direction does it move? How does the caudal fin help in swimming?

2. Watch the pectoral fins. In what directions can the fish make them move? How do they effect swimming?

3. Does the fish swim backwards or swim in one spot? If it does, what fins does it use?

Teacher Information

TRY THIS:
Look closely at a fish swimming about in water. You may want to use a hand lens to observe carefully. How many things can you notice about the fish as it moves?

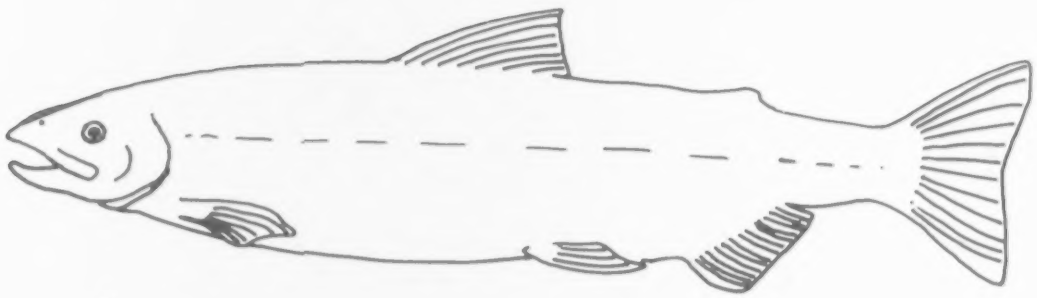
1. How is the fish built for moving through water?
   The body is streamlined for parting the waters. The fish has scales and a coating of slime for protection and less water resistance as it moves. The fish has fins for movement and balance. The fish's body has many muscles to help it move back and forth and up and down.

2. How does the fish swim?
   By wiggling back and forth in a "snake-like" motion, the fish uses its tail fin to propel itself and its side fins to balance and steer itself.

3. How does it turn?
   By moving the pectoral and pelvic fins, the fish can guide its course. The caudal fin will be used for movement in conjunction with the muscles all along the side of the body.

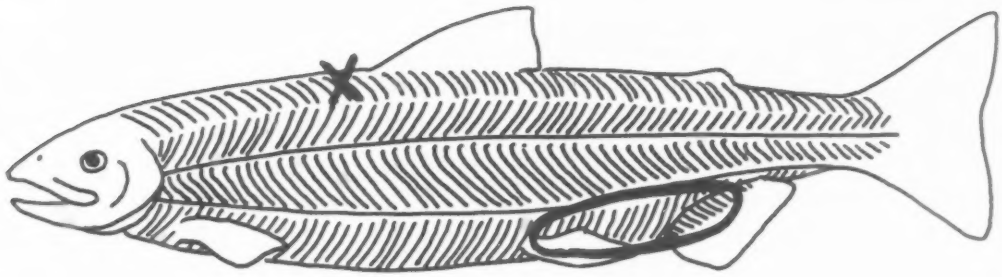
4. How does it move up and down?
   The pectoral and pelvic fins enable the fish to move up and down in the water.

If You Can
Feel the fins of a fish. What do they feel like?



Teacher Information - Key

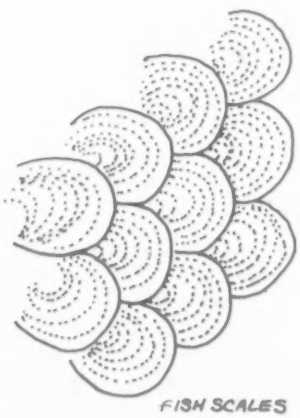
Muscles For Strength



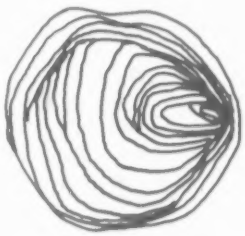
Scales For Protection

TRY THIS:
Investigate the age of a fish.

1. Take a small piece of fish skin and dip it in vinegar.
2. Remove a few of the scales from the skin.
3. Hold one of the scales up to the light. Can you see any rings or lines?_____
4. Use a hand lens (magnifying glass) to see the lines or rings. Now how many do you see? _____
   Students should be able to see 2 or 3 lines on each scale.
5. Each line represents one year of the fish's life.
6. How old was the fish? _____



FISH SCALES



ENLARGED FISH SCALE

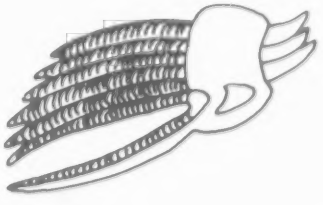
Teacher Information - Key

Gills For Breathing

TRY THIS:

1. Look closely at a goldfish or other small fish as it swims about in a small bowl of water.
2. As the fish swims, does it keep its mouth open or closed? *open*
3. There are two openings in back of the fish's head. How do they move? *in and out in a repeated, rhythmical motion.*
4. Do these openings seem to have anything to do with the fish's mouth? *no*
5. Can you see inside the gill opening as the fish moves? *yes*
6. What do you see? *As the gill opens, you can see the gill filaments and they are bright red in color and feather-like in appearance.*
7. How is a fish built for getting oxygen?

The gills are feather-like structures that allow water to pass over and through them. The fish's mouth is usually open to allow water to enter and the gill cover helps pump water in and out of the fish's body. As the water passes over the gills, they absorb oxygen from the water. The fish uses this oxygen to breathe.



Gill Rakers

NOTE: Students have additional activities to try. However, the activities are participatory and do not require 'correct' answers.

A STREAMLINED ANIMAL

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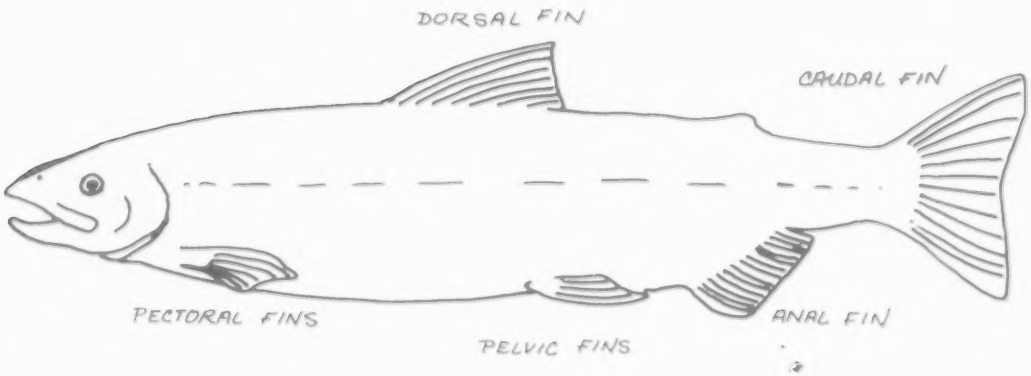
What does streamlined mean? We say a fish is <u>streamlined</u> if it is sharply pointed at the head for parting of the waters, and the larger part of the body tapers back toward the tail so that the water can flow smoothly along the sides. A salmon is indeed built this way.

<u>Fins for Swimming, Speed, and Control</u>
A salmon has seven fins that all work together. There are two pectoral fins and two pelvic fins, one on each side of the body. There is one anal, one caudal and one dorsal fin.



NAME _____

As a salmon moves through the water its movements are similar to an airplane. The caudal fin, or tail fin, is like an airplane's tail-piece and will send the body to the right or left. The fish guides its course through the water with the caudal fin. The powerful tail also acts as a propellor. Pairs of fins on either side of the pectoral and pelvic fins are like an airplane's elevator, helping the fish to move up and down in the water. These fins also act as brake; salmon will use these to slow down, change speed, or stop.

The back fin or dorsal fin and the anal fin help to balance the fish in the water. These two fins keep the salmon from rolling over and over as it moves.

TRY THIS:
Look at a fish swimming about in water. By looking at the fish you will be able to see how the fins help the fish swim.

1. Watch the caudal fin. In what direction does it move? How does the caudal fin help in swimming?

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TRY THIS:
Look closely at a fish swimming about in water. You may want to use a hand lens to observe carefully. How many things can you notice about the fish as it moves?

1. How is the fish built for moving through water?

2. How does the fish swim?

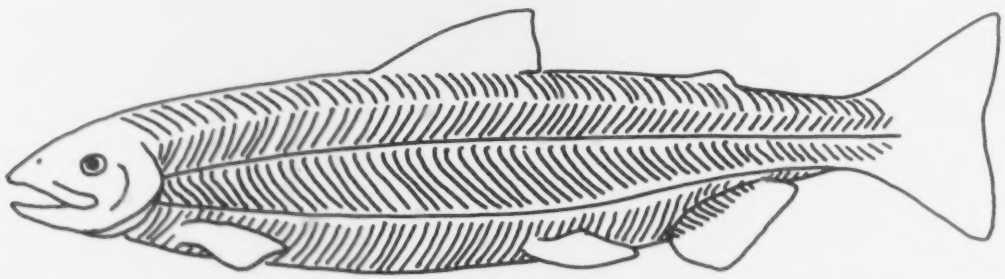
3. How does it turn?

4. How does it move up and down?

If You Can
Feel the fins of a fish. What do they feel like?

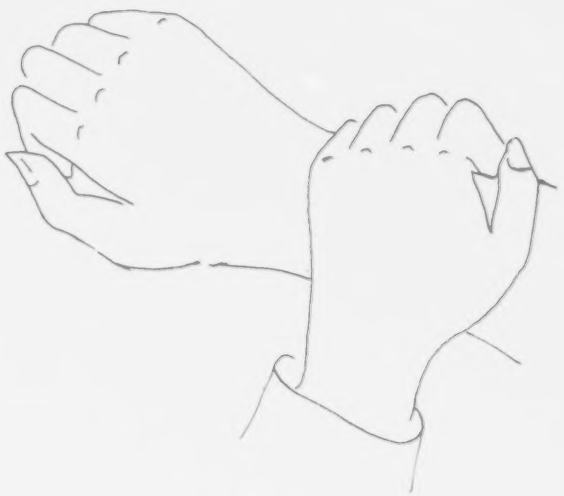
Muscles For Strength
Look closely at the diagram below. Salmon have strong muscles located right beneath the skin layer. Each row of muscles helps the fish to move from side to side and dart quickly about. Fish actually swim by wiggling back and forth in a snakelike motion. Look at the picture below. Find the set of muscles that control the dorsal fin. Put an 'x' on these muscles. Find the set of muscles that would control the pelvic and anal fins. Put a circle on this area.

You can see in this picture that a salmon has many different muscles, just as you do. A fish needs a different muscle for each movement it makes; many are needed to move different parts of its body.



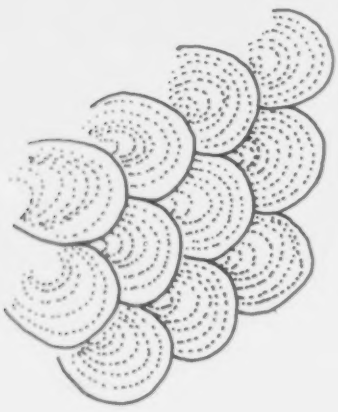
NAME _____

TRY THIS:
Hold your wrist tightly with one hand. Move your fingers. Can you feel the muscles move? Hold your ankle. Move toes up and down, feel the movement? This is like the muscle movement a salmon uses to swim through the water. When you point your toe toward the floor, which muscles move? Are they in the front of your leg or in the back of your heel? Hold your ankle tightly and point your toes to your right, then to the left. Which muscles help make this movement, the ones in front or back of your leg?

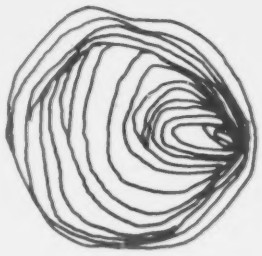


Scales For Protection

A salmon is covered from head to tail by a coat of soft, flexible armor. This armor is made up of scales which are a type of bone. The scales of a salmon increase in size as it grows larger. Rings like the ones that form in tree trunks also form on growing scales. Each ring equals one year of the fish's life. The rings grow closer together in the winter months than in the summertime. Look at the diagram below. Can you count the rings on the fish scale? How old was the fish?



FISH SCALES



ENLARGED FISH SCALE

These scales form a protective covering for the fish. Each shiny scale is embedded in the skin of the salmon; they overlap each other like shingles on a roof. There is also a layer of slime that covers all of the scales. This slime acts as a shield to help protect the skin.

TRY THIS:
Investigate the age of a fish.

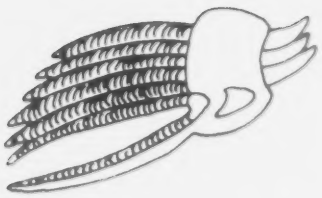
1. Take a small piece of fish skin and dip it in vinegar.
2. Remove a few of the scales from the skin.
3. Hold one of the scales up to the light. Can you see any rings or lines? _____
4. Use a hand lens (magnifying glass) to see the lines or rings. Now how many do you see? _____
5. Each line represents one year of the fish's life.
6. How old was the fish? _____

NAME _____

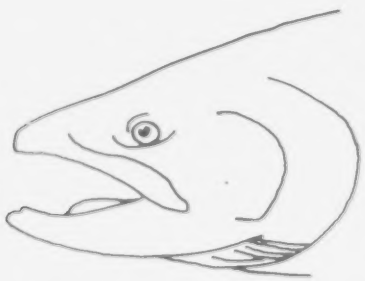
Gills For Breathing

A salmon has a pair of nostrils in front of its eyes. These nostrils are used for smelling and are very sensitive to different odors in water, but they are not used for breathing. A fish breathes by opening its mouth and taking in water. It then closes its mouth and the gill cover in back of its head opens. The water passes out through the gill opening. The gill covers open and shut to let water leave that has been taken in through the mouth. Find the gill cover in the picture below. As the water passes out through the opening it travels over the gill filaments and oxygen is taken from the water for the fish to use. There is dissolved oxygen in the water. The gill filaments absorb oxygen that is in the water. The fish must always keep water flowing through its gills so that it can use the oxygen in the water to breathe.

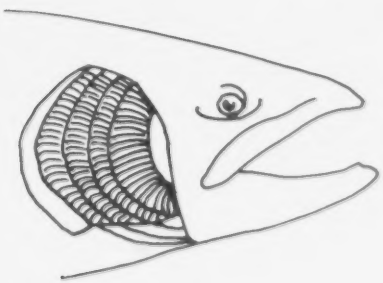
Look at the picture of the fish's head. Do you see the gill filaments? These help the fish breathe. Do you see the gill rakers? Their job is to strain food out of the water for the fish to use. With your finger trace the pattern the water would make as it travels into the mouth and out of the gill cover or opening.



GILL RAKERS



GILLS COVERED



GILLS UNCOVERED

TRY THIS:

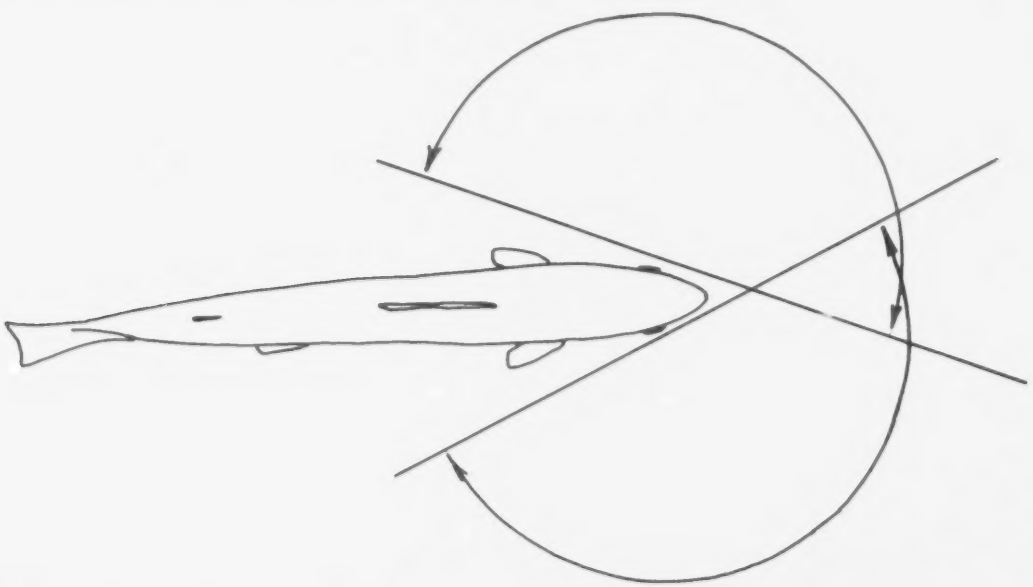
1. Look closely at a goldfish or other small fish as it swims about in a small bowl of water.
2. As the fish swims, does it keep its mouth open or closed? _____
3. There are two openings in back of the fish's head. How do they move? _____
4. Do these openings seem to have anything to do with the fish's mouth? _____
5. Can you see inside the gill opening as the fish moves? _____
6. What do you see? _____
7. How is a fish built for getting oxygen? _____

If You Can:

Look at a set of gills from a large fish. Feel the hair-like structures. What color are the gills? Can you see the gill filaments? Can you find the gill rakers?

Eyes for Underwater Vision

The eyes of a fish are always open. They do not have eyelids to close when they are tired. If you look at the picture above, you will notice the salmon's eyes are far apart. They do not point in the same direction as your eyes do. Each eye has a wide field of vision and can also see in front of the body.



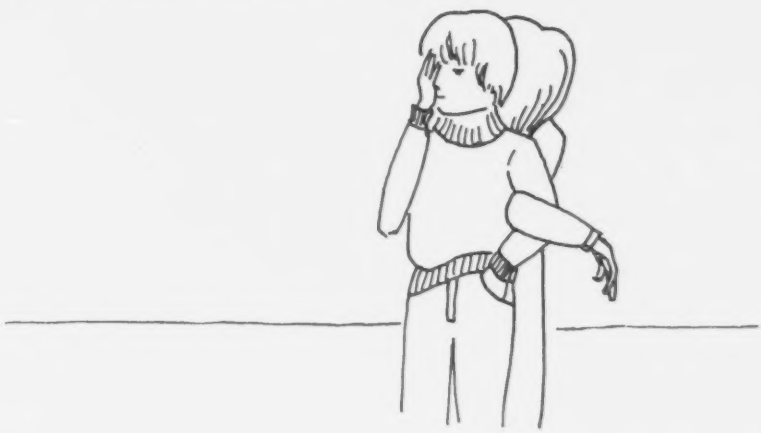
NAME _____

Look at the arrows on each side of the salmon's body. This is the area in which it can see different objects. The salmon is able to see a good distance on either side of its body, but objects in front of the fish may be a little blurry.

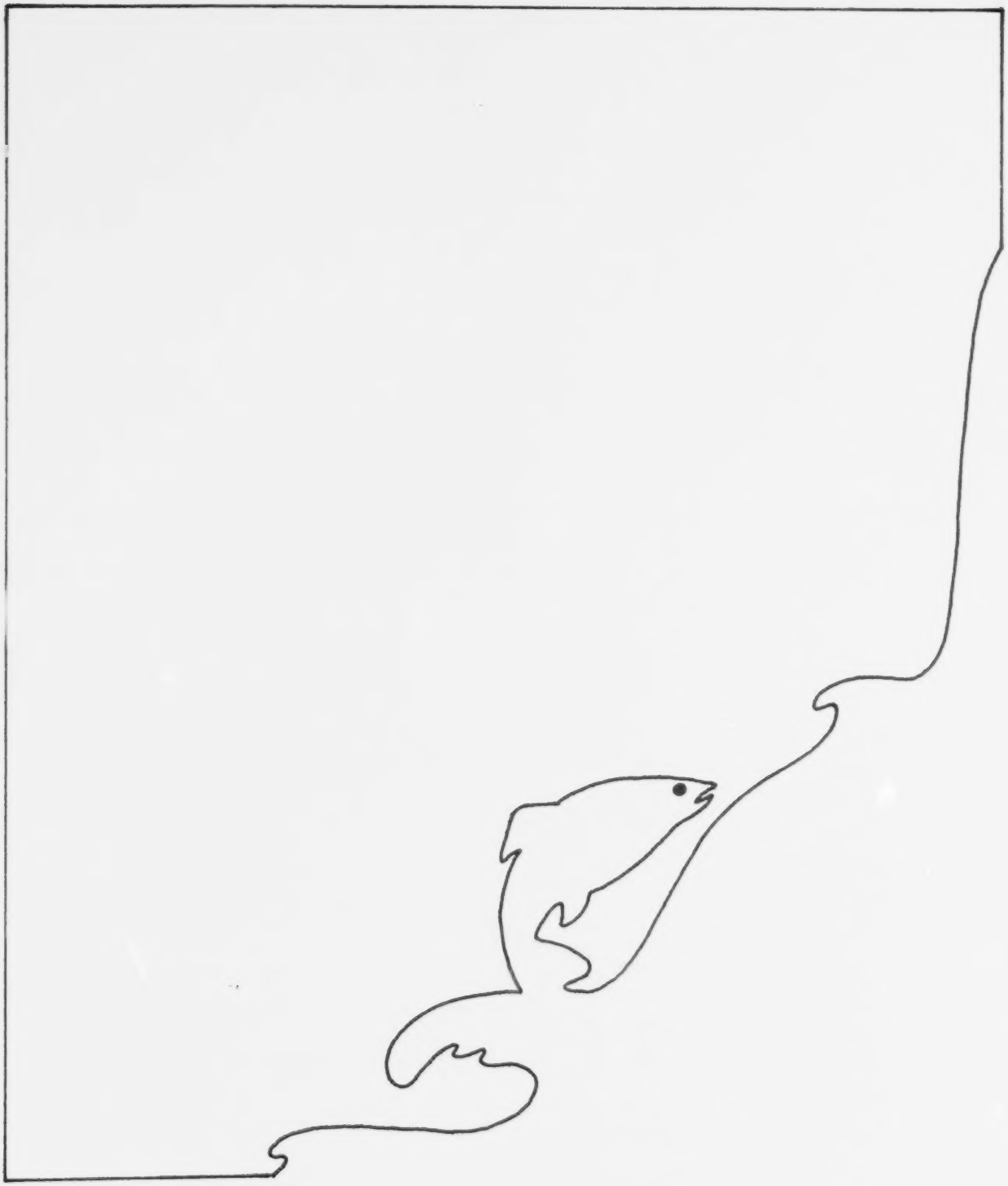
Fish can see some color and can adjust to seeing in deep, deep water where there is not much light.

TRY THIS:

1. Choose a partner.
2. Stand back to back
3. Link one arm together with your partner.
4. Have one student cover his/her right eye and another student cover his/her left eye. Eyes should be closed on the opposite side of the body of the linked arms. Walk in direction that eyes are closed. (See diagram.)



The area that each pair can see in front of them is close to the area a fish could see as it traveled through the water. Objects in front of the fish may be difficult to see. Objects to the side are easy to see.



ACTIVITY 8:

BUILD A SALMON FACT BOX (2-3 DAYS)

ACTIVITY 8: BUILD A SALMON FACT BOX (2-3 DAYS)

CONCEPTS:

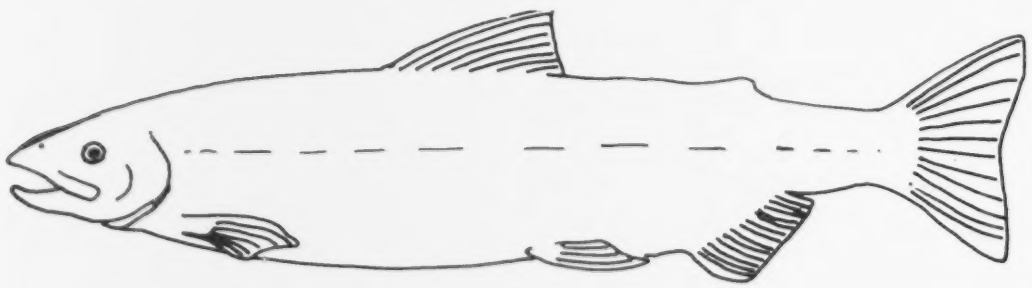
1. During each stage of its life cycle, a salmon is adapted to its environment.
2. At each stage of its life a salmon is faced with danger.
3. All salmon species follow certain migration patterns in their lives.

OBJECTIVES: Students will demonstrate ability to:

1. follow directions in order to construct a salmon fact box as a classroom learning aid.
2. write 4 salmon questions and answers by recalling previously learned salmon facts.
3. respond correctly to 4 questions on a salmon box created by a classmate.

TEACHER PREPARATION:

1. Ask each class member to bring a shoe box to class.
2. Construct a sample copy so you can demonstrate construction to the group. (See diagram #8 under Procedures)
3. Get dark (blue, black, gray) construction paper; one 12"x18" and one 8"x12" piece per students, or an equal amount of butcher paper per student.
4. Ask students to have scissors, glue, crayons, colored markers for the project.
5. Review salmon facts from Activity 2; you may want to make a quick list of stages of a salmon's life and dangers it encounters as a reference for discussion with class.
6. Make tagboard salmon patterns.



MATERIALS:

1. One Class Set of:
   shoe box
   12" x 18" and 12" x 8" of dark construction paper (to cover shoebox) or equal amount of butcher paper.
   glue, scissors, crayons or colored markers

large sheet of 12" x 18" white construction paper (to make fish cut-outs.)

2. 7 to 10 tagboard fish patterns (if students wish to use a pattern to trace.)

PROCEDURES:

1. Distribute the two pieces of paper to each student; also distribute one large white construction paper per student.

2. Ask students to remove top from shoebox and cover all the sides with dark construction paper. Wrap it as you would gift wrap a package. This may be put aside until later.

3. Review important stages and dangers of salmon's life and write some of these on the board.

4. Explain to students that they will need to develop 4 questions to place on their salmon fact box; including dangers, stages, life cycle, etc.

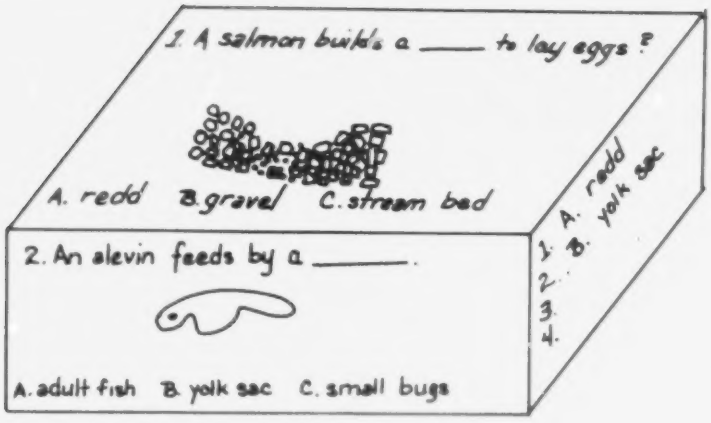
5. Ask students to write 4 questions and answers on a piece of paper. Sample questions :

   A. Anadromous fish live in:
      A. salt water B. fresh water C. both A and B
   B. A salmon egg nest is called a:
      A. alevin B. redd C. streambed
   C. Salmon enjoy swimming in warm water. True False
   D. There are 5 species of salmon found in the Northwest
      True False
   E. A sockeye salmon turns black and green before it spawns.
      True False
   F. King salmon are the _____ of the species.
      largest smallest
   G. Salmon are good to eat after they have spawned.
      True False

6. Explain that each question will become one panel of their fact box; also that each question will need to be illustrated. With the white construction paper they may draw a picture to go with each question - caution them that pictures can be no larger than the side of the box.

7. Each question must be numbered and not too lengthy.

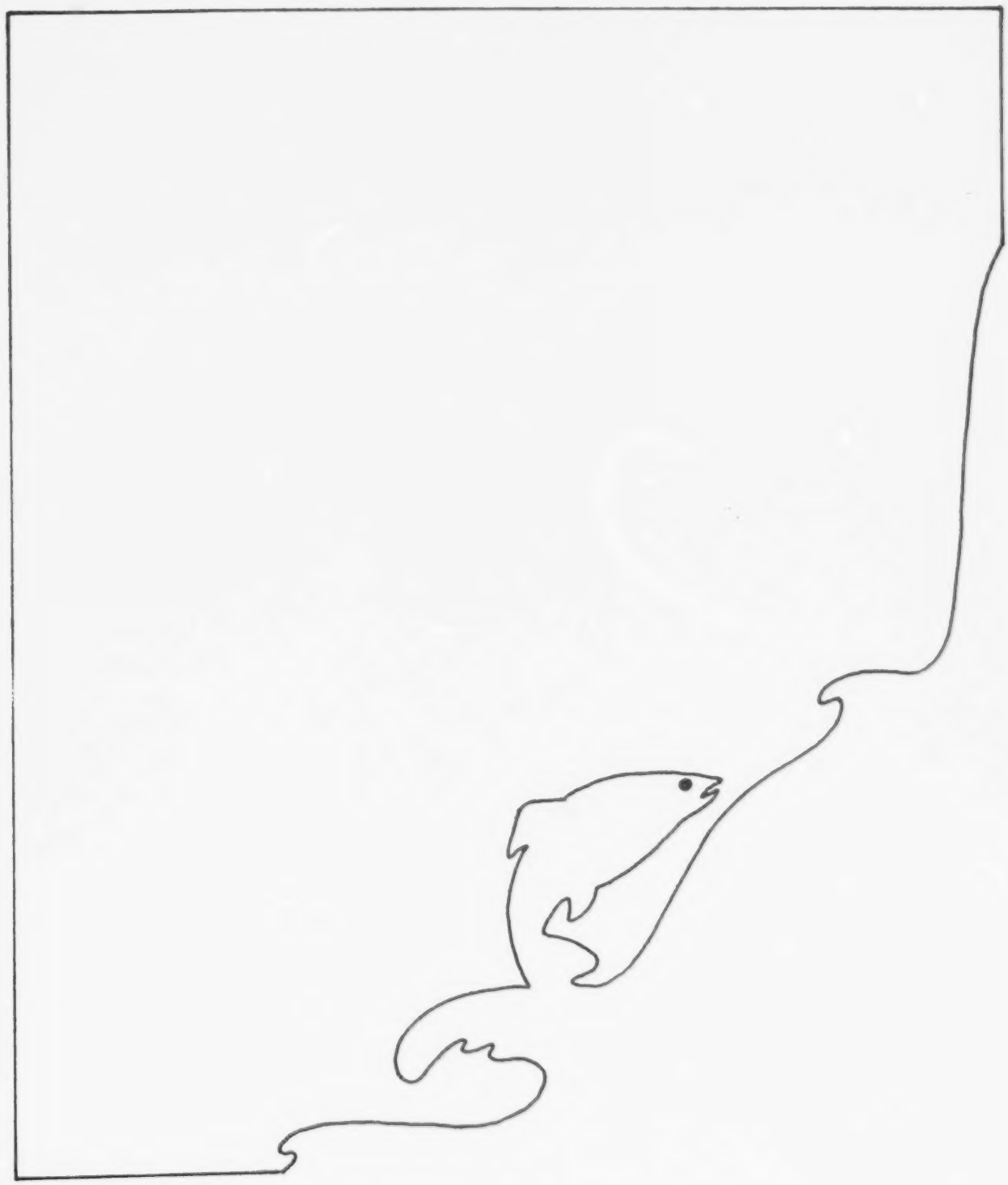
8. Answers will be placed on white paper at the end of the shoe box. (Examples:


1. A salmon builds a ____ to lay eggs?
A. redd B. gravel C. stream bed
2. An alevin feeds by a ____.
A. adult fish B. yolk sac C. small bugs
1. A. redd
B. yolk sac
2.
3.
4.

9. After the question is written, it should be rewritten on 1" x 7" strip of white paper and pasted to the bottom of the shoe box. Remember questions must be numbered.

10. Students may wish to exchange boxes and divide into pairs. They may then ask each other the questions on their boxes.

11. Salmon fact boxes will make a nice classroom display and allow for students to review information independently or with a classmate.



PEOPLE, PLACES AND THINGS: A RESOURCE LIST

PEOPLE, PLACES AND THINGS: A RESOURCE LIST

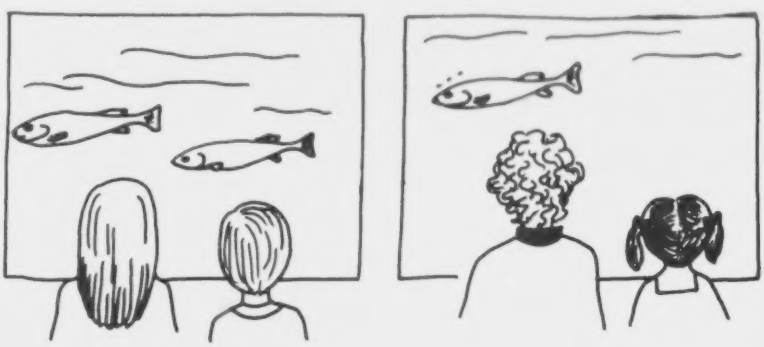
As you teach this unit, you may wish to take students on a field trip or have a guest speaker come to the classroom. There are a variety of resources available to teachers and students within the state of Washington. The following list will provide ideas for: 1) an afternoon outing; 2) guest speakers that will come to your school; 3) people to contact for further information; 4) films you may wish to order and other resources you might like to use.

Places to Visit

The Lake Washington Ship Canal Fish Ladder
Seattle District, Army Corps of Engineers
4735 East Marginal Way South
Seattle, WA 98134
764-3750 or 783-7001

Viewing time: 7:00 a.m. to 9:00 p.m. daily. From July to November you may see either Chinook, Coho or Sockeye passing through the fish ladder.

LAKE WASHINGTON SHIP CANAL FISH LADDER



Seattle Aquarium
Pier 59
Seattle, WA 98101
625-4358 Sea Art: 625-5028

The Aquarium has a fish ladder in operation and holding pens for small salmon fry. These are very good facilities for public viewing and an educational opportunity for school groups. The Aquarium also offers a Sea Art program. For the price of admission students will listen to a biologist discuss some aspects of sea life (salmon) then take part in an art project related to that animal. A local artist will lead the 2-hour session. Call for more information.

You may also wish to enroll your class in a Salmon Life Cycle class - beginning in October, 1980. Students view a slide show, participate in lab work and view the Aquarium's salmon facilities. Again, call for more information. There are special rates for handicapped students.

Teacher Information

Pacific Science Center
200 Second Avenue North
Seattle, WA 98109
625-9333

Upon request, a visit to the Kwakiutl Longhouse with a legend about salmon and fishing can be provided. Students can also explore the Puget Sound model which accelerates daily tidal cycles to illustrate water flow patterns and their effects.

Hatcheries in the State of Washington

University of Washington Department of Fisheries
M-1 Fisheries Center WH-10
University of Washington
Seattle, WA 98195
543-9640 (Fisheries Club)
543-6546 (Seward park-Ernie Brannen)

The University of Washington Fisheries Club will give students a complete tour of fish hatchery facilities.

There are many hatchery facilities located in the state of Washington; one of the following may be closer to your school.

Columbia River: Cowlitz, Elokomin, Grays River, Kalama Falls, Klicitat, Lewis, Lower Kalama, Ringlod, Speelyai, Toutle and Washougal.

Puget Sound: Dungeness, George Adams (Shelton), Green River, Hood Canal, Issaquah, Miner Creek, Nooksak, Puyallup, Samish, Skagit and Skykomish.

Coastal Washington: Nemah, Simpson (Satsop River), and Willapa (Raymond).

For more information, addresses and phone numbers of the above, call Ed Moore - (206) 392-3180

Stream Visitation

Students in the King County area may wish to visit a nearby stream and have a Fisheries Biologist meet them there to discuss stream water conditions, i.e., good habitat for salmon, pollution factors, erosion, water temperature, etc. This is a good opportunity to examine stream water in your own community.

Kurt Reidinger
C/O Salmon Enhancement Program
Metro Center
821 Second Avenue
Seattle, WA 98104 447-6585

Teacher Information

Indian Reservations

You may wish to visit an Indian Reservation that has an aquaculture or a salmon hatchery program in operation. The Lummi, Puyallup, Suquamish and others have fishery programs that would accomodate a student field trip.

Community Education Director
United Indians of All Tribes
Discovery Park P.O. Box 99253
Seattle, WA 98199 285-4425

People to Contact

You may wish to have a guest speaker come to your classroom to discuss some aspect of the salmon life cycle, or have an assembly for several grades.

Gene Smaldino of Northwest Steelheaders will discuss some of the salmon enhancement operations that are currently taking place in the Northwest. He will also provide a salmon box display model and film.

Gene Smaldino
Northwest Steelheaders
7210 6th N.W.
Seattle, WA 98107
525-3100

Ruth Hertz, of Metro, will provide a speaker for your classroom on water pollution, toxicants and chemical wastes we find in water today. Discussion of the effects of anti-freeze, crank-case oil and pesticides on stream animals and habitation.

Ruth Hertz
Public Information Supervisor
Metro M.S. 62
821 Second Avenue North
Seattle, WA 98104
447-6768

Claire Dyckman or Tony Angell, State Office of Environmental Education. If time permits, it may be possible to have Sammy Salmon visit your classroom or assembly to discuss dangers to salmon and the importance of this resource to the Northwest. An adult wears a large silver salmon costume; a movie on the Life Cycle of the Salmon is also shown.

Tony Angell, Supervisor
Washington State Office of Environmental Education
Northwest Section
C/O Shoreline District Offices
N.E. 158th and 20th Avenue N.E.
Seattle, WA 98155
365-0533

Gib Moore, high school teacher, Salmon Enhancement Program. May be able to arrange for high school students to come to your classroom to explain and discuss their participation in salmon enchancement for over two years. A slide show is also available.

Gib Moore
Juanita High School
13610 - 132nd Avenue N.E.
Kirkland, WA 98033
821-0600

Laura Mumaw or Sherri Sheng, Fishery Biologists. May be able to make further suggestions for interesting salmon-related activities. Write to them at:

Seattle Aquarium
Pier 59
Seattle, WA 98101
625-4358

Dennis Wilson, Metro, Associate Water Quality Planner. May be able to provide your classroom with their own vial containers of fish egg and fry specimens.

Dennis Wilson
Municipaltiy of Metropolitan Seattle
821 Second Avenue
Seattle, WA 98104
447-6361

Films, Books and Other Publications

The Washington State Office of Environmental Education, Northwest Section, may provide your school with any of the following films on a two-week loan basis. Call for delivery/pick-up arrangements - 365-0433.

WATER IS LIFE - An 11 min. film on streams and their importance, showing public groups involved in activities to preserve watersheds. Filmed locally. Good introduction. Elementary and Secondary.

FRAGILE RESOURCE - A 26 min. film on the Ribco Basin Study which discusses the impact of development on Puget Sound river valleys and reviews the recommendations for management made by the River Basin's Commission. Secondary.

LIFE CYCLE OF SALMON - A 10 min. film showing salmon returning to spawn in a river with spectacular shots of leaping salmon and of spawning behavior. An old film, part of Man: A Course of Study. Good introduction; discussion should be modified to apply to small streams. (Shoreline School District A.V.)

KELSEY CREEK - A 10 min. film showing the University of Washington interdisciplinary studies on Kelsey Creek. Perhaps best for career orientation and scientific methods rather than for stream restoration. Secondary. (City of Bellevue)

OUR SALMON HERITAGE - A slide-tape presentation introducing the salmon enhancement program on Juanita, Kelsey and Thornton Creeks. Good review of streams as they relate to both salmon and storm water runoff. Elementary and Secondary. (King county Resource Planning 344-7990, Metro/Rachel Ben-Schmuel)

NATIONAL MARINE FISHERIES - A filmstrip and tape reviewing the history of fisheries in the United States, their role in the economy, associated political issues. (EE)

WATER - A U.N. film on the problems of watersheds globally. Useful as a follow-up to stream and salmon activities to remind students that local concern for water quality is paralleled in all cultures. Elementary and Secondary.

FIREWOOD - A U.N. film on the scarcity of firewood globally. The film documents clearly how deforestation of mountains in Nepal causes flooding, silting, loss of farmlands on the Ganges. Again, a good follow-up after students understand flooding in local watersheds. Elementary and Secondary.

STILL WATERS - A 14 minute, color film. "Non-narrative, involvement film. By the poetic combination of music and striking . . . photography, the viewer is given an unusual view of animal life in a watery environment." Elementary and Secondary. (ESD 121)

You can order for your classroom 6 18"x21" full color posters depicting the five Pacific Ocean salmon species and steelhead. $5.00 per set. Order from: B.C. Wildlife Federation, 5659 176th St., Surrey, B.C. V3S 4C5

For more information on salmon and related topics, contact:

Sea Grant
Divison of Marine Resources
3716 Brooklyn Avenue NE
Seattle, WA 98105
543-6600

The National Park Service has developed a classroom game and a coloring book regarding the salmon life cycle. To obtain student copies:

National Park Service Pacific Northwest Region
Cooperative Park Studies Unit
College of Forest Resources
University of Washington
Seattle, WA 98195

Resource Books and Articles

Brown, Margaret E. The Physiology of Fishes, Volume 1 Metabolism. Academic Press, Inc. New York, NY. 1957.

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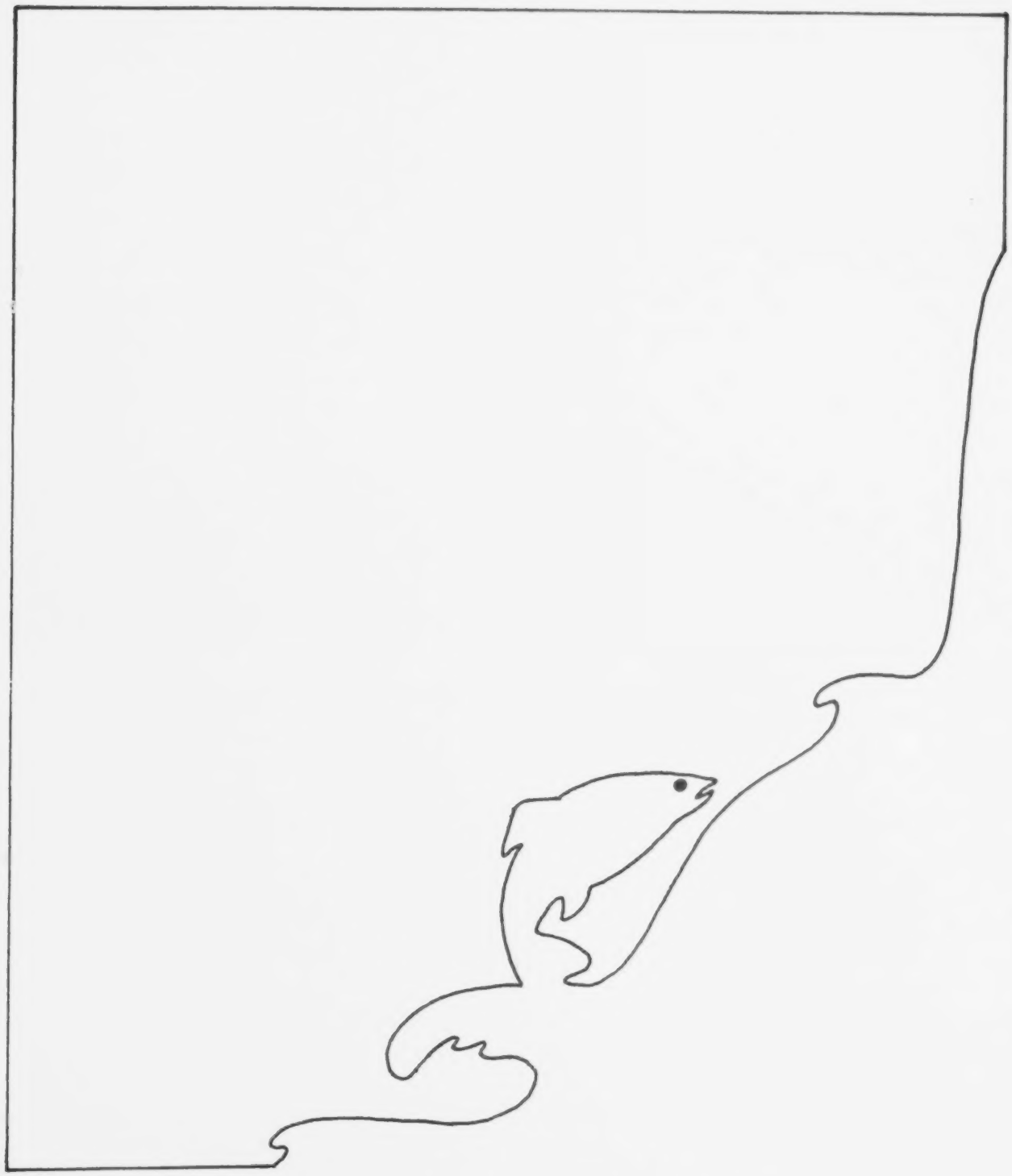


EVALUATION

VOCABULARY

BIBLIOGRAPHY

NAME_____

LIFE CYCLE OF THE SALMON

Read the steps in the life cycle of a salmon. Then draw a picture or diagram in the boxes to illustrate each step.

1. Salmon travel throughout the ocean feeding on other small fish and sea creatures.

2. Salmon travel upstream to spawn. Many adults have changed in looks and color.

3. Females build nests to lay eggs. Males are close by to fertilize the eggs. This is called a redd.

4. After the eggs are laid, the adult salmon die.

5. The eggs hatch into tiny fish with yolk sacs. They are called alevin. They stay under the gravel for 8 weeks.

6. The young salmon is now about 2 inches long and is called a fry or fingerling. It will begin to travel downstream to the sea and saltwater.

7. The young salmon is now living in the ocean. It will face many dangers. Can you draw it?

8. The salmon is now an adult and will be ready to return to the stream in 2 to 5 years. Draw another adult salmon.

LIFE CYCLE OF THE SALMON

1. Name four species of salmon found in Pacific Northwest waters.

   A. Sockeye, Chum, Coho B. Red, Humpie, Pink

   C. Tyee, Silver, Blackmouth D. Dog, King

2. Identify three reasons why a salmon may not complete its life cycle.

   A. Fishermen B. Pollution

   C. Natural Predators

3. Salmon find their way back to the stream of their birth by sense of smell.

4. Fish breathe underwater with gills. The outside of this area has a gill covering, that helps move the water in and out so that salmon can breathe.

5. A salmon is anadromous because it lives in both fresh water and salt water.

6. Identify four fins a salmon has.

   A. Anal B. Caudal

   C. Pectoral D. Dorsal, Pelvic

7. Erosion is bad for animal life because it (accept any reasonable answer)

8. Alevin stay underneath gravel for 6 to 8 weeks. During this time they are fed by their yolk sacs.

9. Some places a Pacific Northwest salmon may travel are: California, Oregon, and Canada, Soviet Union, Alaska, etc.

10. The female salmon may produce up to 3,600 eggs.

NAME _____

LIFE CYCLE OF THE SALMON

1. Name four species of salmon found in Pacific Northwest waters.

   A. _____ B. _____

   C. _____ D. _____

2. Identify three reasons why a salmon may not complete its life cycle.

   A. _____ B. _____

   C. _____

3. Salmon find their way back to the stream of their birth by _____

   _____.

4. Fish breathe underwater with _____. The outside of this area has a _____, that helps move the water in and out so that salmon can breathe.

5. A salmon is anadromous because it _____

   _____.

6. Identify four fins a salmon has.

   A. _____ B. _____

   C. _____ D. _____

7. Erosion is bad for animal life because it _____

   _____

8. Alevin stay underneath gravel for 6 to 8 weeks. During this time they are fed by _____.

9. Some places a Pacific Northwest salmon may travel are: _____, _____, and _____.

10. The female salmon may produce up to _____ eggs.

TRUE OR FALSE

1. (T) F Different salmon species have different life cycles.
2. T (F) Streams are good for young fish if they don't have any trees or bushes around.
3. T (F) A female salmon builds a nest with straw and twigs.
4. T (F) Fish can see objects the best that are in front of them.
5. T (F) A young smolt has a yolk sac.
6. (T) F Salmon can live from 2 to 7 years.
7. T (F) Salmon need a lot of silt and soil in the water before they can lay their eggs.
8. (T) F Some Alaskan King salmon can jump 10 feet out of the water to clear a waterfall.
9. T (F) It is a good idea to take spawning salmon from rivers, streams and creeks whenever you can.
10. (T) F Fish hatcheries and fish ladders help many Northwest salmon return to rivers to spawn.

NAME _____

TRUE OR FALSE

1. T F Different salmon species have different life cycles.

2. T F Streams are good for young fish if they don't have any trees or bushes around.

3. T F A female salmon builds a nest with straw and twigs.

4. T F Fish can see objects the best that are in front of them.

5. T F A young smolt has a yolk sac.

6. T F Salmon can live from 2 to 7 years.

7. T F Salmon need a lot of silt and soil in the water before they can lay their eggs.

8. T F Some Alaskan King salmon can jump 10 feet out of the water to clear a waterfall.

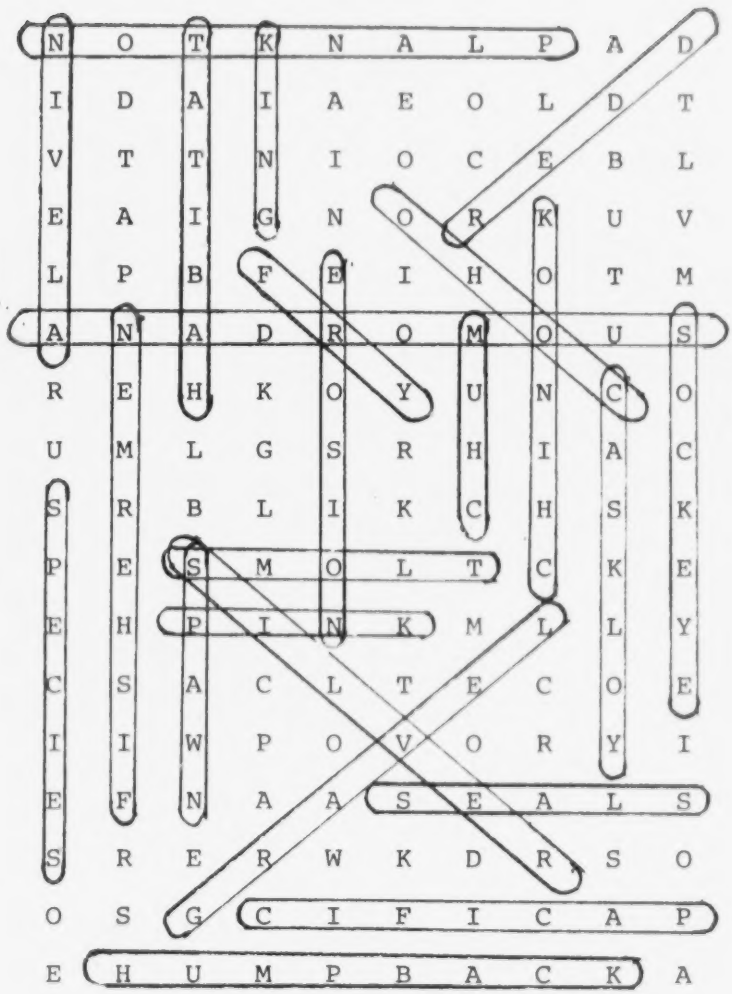
9. T F It is a good idea to take spawning salmon from rivers, streams and creeks whenever you can.

10. T F Fish hatcheries and fish ladders help many Northwest salmon return to rivers to spawn.

Teacher Information (Key)

SALMON WORD SEARCH

Alevin
Anadromous
Chinook
Chum
Coho
Erosion
Fishermen
Fry
Gravel
Habitat
Humpback
King
Pacific
Pink
Plankton
Redd
Seals
Silver
Smolt
Sockeye
Spawn
Species
Yolk Sac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I D A I A E O L D T
V T T N I O C E B L
E A I G N O R K U V
L P B F E I H O T M
A N A D R O M O U S
R E H K O Y U N C O
U M L G S R H I A C
S R B L I K C H S K
P E S M O L T C K E
E H P I N K M L L Y
C S A C L T E C O E
I I W P O V O R Y I
E F N A A S E A L S
S R E R W K D R S O
O S G C I F I C A P
E H U M P B A C K A

Name_____

SALMON WORD SEARCH

Alevin	N	O	T	K	N	A	L	P	A	D
Anadromous	I	D	A	I	A	E	O	L	D	T
Chinook	V	T	T	N	I	O	C	E	B	L
Chum	E	A	I	G	N	O	R	K	U	V
Coho	L	P	B	F	E	I	H	O	T	M
Erosion	A	N	A	D	R	O	M	O	U	S
Fishermen	R	E	H	K	O	Y	U	N	C	O
Fry	U	M	L	G	S	R	H	I	A	C
Gravel	S	R	B	L	I	K	C	H	S	K
Habitat	P	E	S	M	O	L	T	C	K	E
Humpback	E	H	P	I	N	K	M	L	L	Y
King	C	S	A	C	L	T	E	C	O	E
Pacific	I	I	W	P	O	V	O	R	Y	I
Pink	E	F	N	A	A	S	E	A	L	S
Plankton	S	R	E	R	W	K	D	R	S	O
Redd	O	S	G	C	I	F	I	C	A	P
Seals	E	H	U	M	P	B	A	C	K	A
Silver										
Smolt										
Sockeye										
Spawn										
Species										
Yolk Sac										

VOCABULARY

Alevin - newly hatched salmon with its yolk sac still attached to its body.

Anadromous - a fish that lives in both fresh water and salt water.

Anal fin - fin located on bottom side of fish closest to the tail, used for balancing.

Armor - a tough, protective covering such as scales.

Caudal fin - tail fin used for locomotion.

Dorsal fin - fin located on top of the fish, used for balancing.

Erosion - when earthy or rocky material is removed from any part of the earth's surface by weathering, corrosion, dissolution or abrasion.

Fertilize - the process of combining sperm with egg to create new life.

Fingerling - an older Pacific salmon that eats small plant life and lives in a stream.

Fry - salmon young that have used up their yolk sac and have gone from the gravel bed and are ready to feed.

Gill - the respiratory organ of fishes.

Habitat - the area or type of environment in which an animal normally lives.

Migrate - to move to another region.

Pectoral fin - two fins located closest to the gills on the sides of a fish, used for steering and braking.

Pelvic fin - two fins located on the underside of the fish's body, close to the head; used for balancing.

Predator/prey- term used to describe the animal that hunts its food; it lives by preying upon others. The hunter's victim is its prey.

Redd - a round hole in a gravel bed where salmon eggs stay for about 8 weeks covered by loose gravel.

Teacher Information

Smolt - A young salmon that has changed from living in fresh water to salt water.

Spawn - To lay and fertilize eggs.

Species - Different types or kinds of animals. In the Northwest there are five species of salmon: 1. Chum (dog); 2. Pink (humpback); 3. Silver (coho); 4. King (chinook or tyee); 4. Sockeye (red).

Trophic scale- The scale or pattern of who eats whom in the animal kingdom.

Yolk sac - The small sac that is attached to the baby salmon as it hatches from the egg.

NAME_____

VOCABULARY

Alevin

Anadromous

Anal fin

Armor

Caudal fin

Dorsal fin

Erosion

Fertilize

Fingerling

Fry

Gill

Habitat

Migrate

Pectoral fin

Pelvic fin

Predator/prey

Redd

NAME_____

Smolt

Spawn

Species

Trophic scale

Yolk sac

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